HOBBIES • INVENTIONS • HANDICRAFT

AUGUST

MODERN MECHANIX

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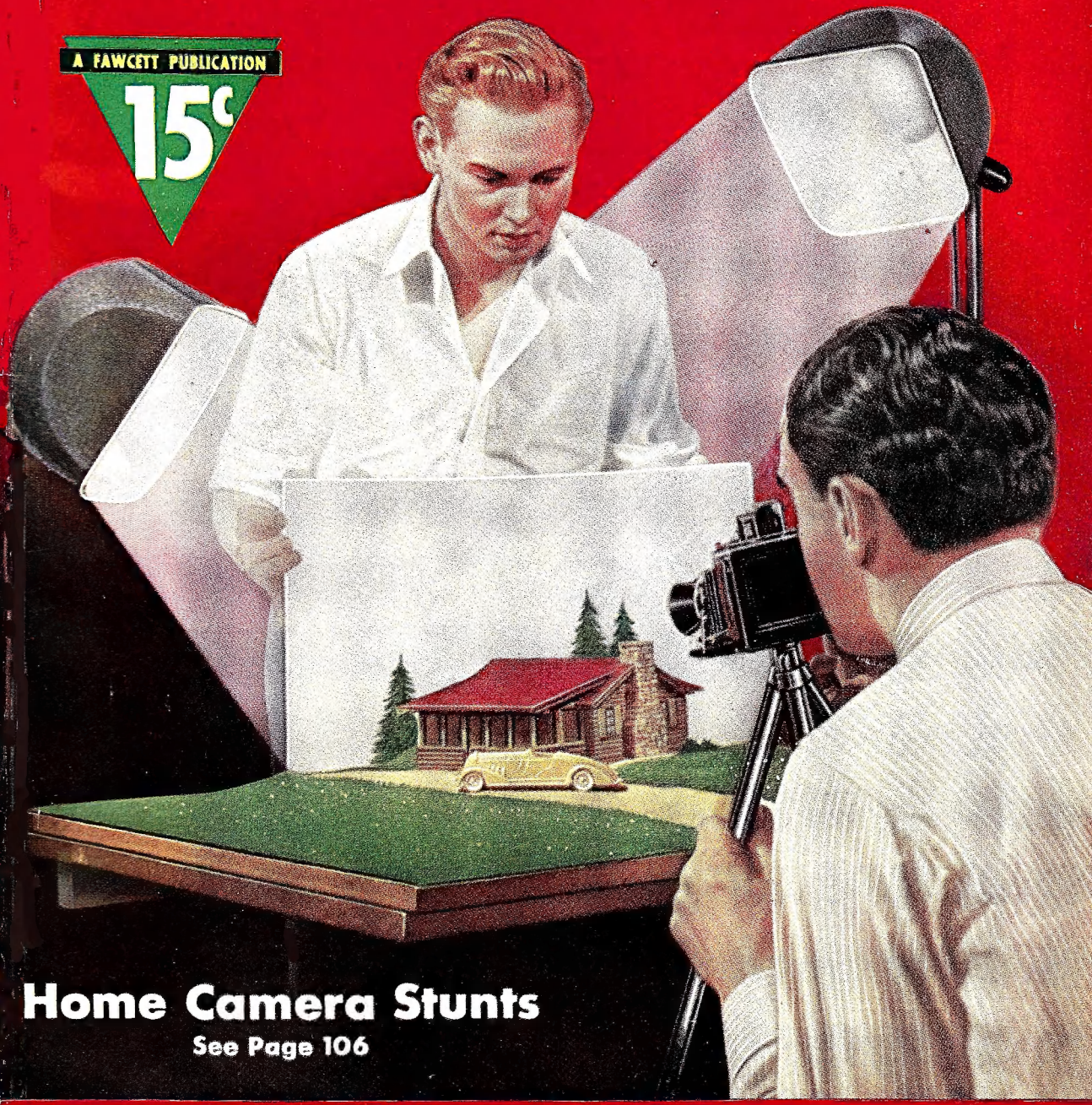

Home Camera Stunts

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ZEPPELINS PROVED SAFE!

AUG. 1937

MODERN MECHANIX HOBBIES AND INVENTIONS

15 c

GRANTLAND RICE REPORTS:

OFF THE ROAD THEY SHOT AS AN UNSEEN DEMON THREW THEIR CAR OUT OF CONTROL

GRANTLAND RICE
Well-known Sports Commentator, Radio Announcer and Columnist

GRANTLAND RICE Describes The Unhappy Ending To A Seattle Motorist's Week-End Trip To Mt. Baker

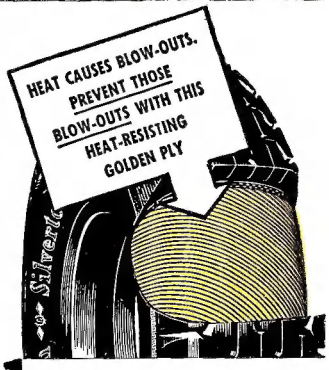
THE STRAINS of "When We Come To The End of A Perfect Day" seemed to fit the mood of Mr. Jack Davis of Seattle, Washington, and his party of four, as they motored down from Mt. Baker that Sunday afternoon. And when the familiar Everett highway finally was reached, they were still recounting the experiences of that care-free week-end.

Then, with startling suddenness, the scene changed. BANG! The left front tire had blown out with the noise of a thunderclap! A terrible drag set in. The steering wheel jerked itself right out of Mr. Davis' control. Down went the brakes. But too late. Off the road they shot.

Blow-out Protection

Why any motorist should take chances by riding around on ordinary tires is beyond me. Especially when Goodrich has perfected a tire invention that brings *real* blow-out protection. This revolutionary construction, which they call the Life-Saver Golden Ply and which is found *only* in Goodrich Silvertowns, is a layer of special rubber and full-floating cords, scientifically treated to resist the terrific blowout-causing heat generated *inside* all tires by today's higher speeds. By resisting this heat, the Golden Ply protects you against these high-speed blow-outs.

One blow-out was enough to cure Mr. Jack Davis. Now you'll find his car equipped with Goodrich Safety Silvertowns. Make up your mind to "beat a blow-out to the punch" by starting to ride on Silvertowns *today*. They're on sale at Goodrich Silvertown Stores and Goodrich dealers *everywhere*.



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With Life-Saver Golden Ply Blow-Out Protection

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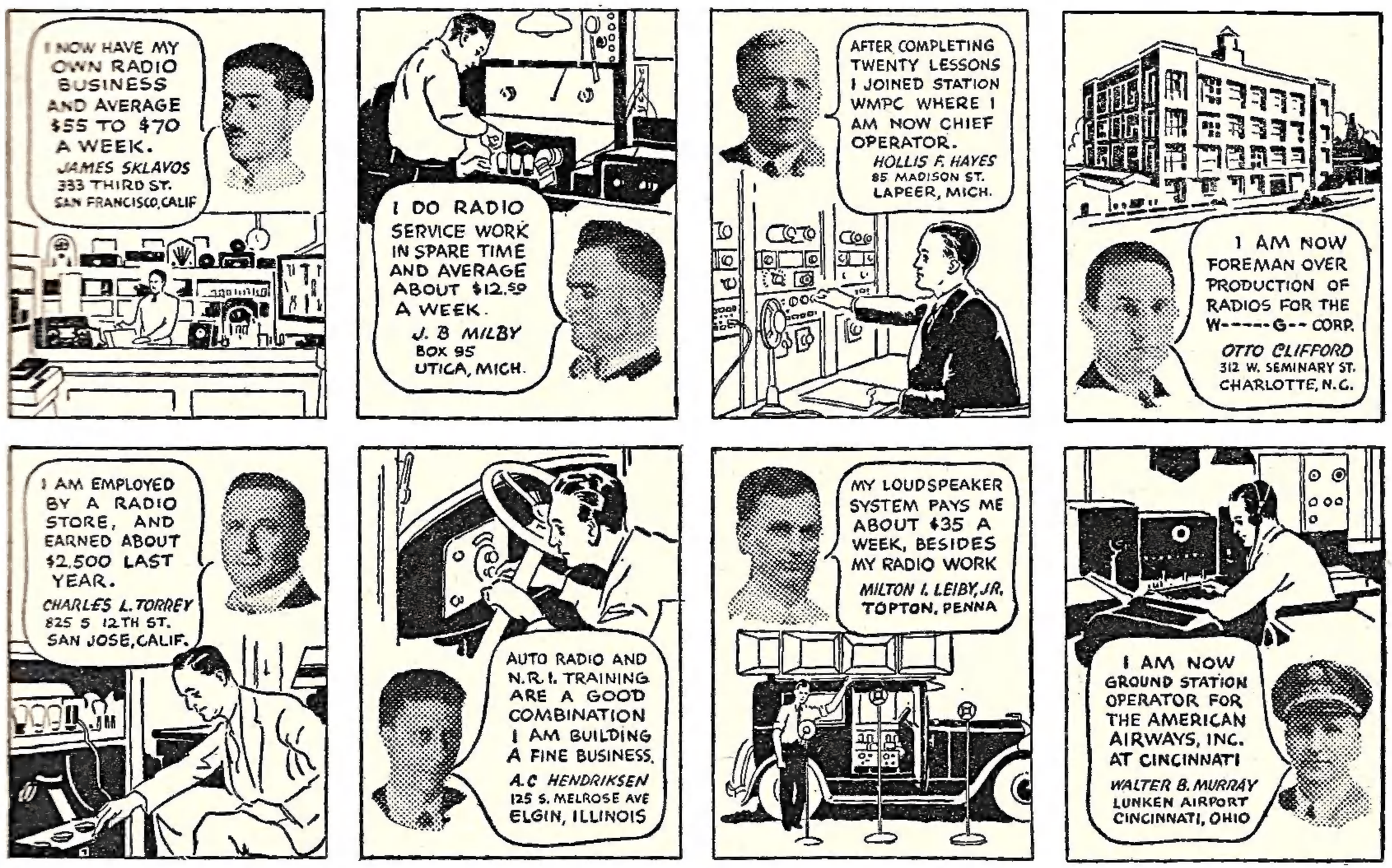
of Men I Trained at Home For RADIO



I WILL TRAIN YOU AT HOME *in Spare Time*
FOR A GOOD RADIO JOB

J. E. SMITH, President
National Radio Institute

Many Radio Experts Make $30, $50, $75 a Week

Do you want to make more money? Broadcasting stations employ engineers, operators, station managers and pay up to $5,000 a year. Spare time Radio set servicing pays as much as $200 to $500 a year—full time servicing jobs pay as much as $30, $50, $75 a week. Many Radio Experts own their own full time or part time Radio businesses. Radio manufacturers and jobbers employ testers, inspectors, foremen, engineers, servicemen, paying up to $6,000 a year. Radio operators on ships get good pay and see the world besides. Automobile, police, aviation, commercial Radio, and loud speaker systems offer good opportunities now and for the future. Television promises many good jobs soon. Men I trained at home are holding good jobs in all these branches of Radio.

Many Make $5, $10, $15 a Week Extra in Their Spare Time While Learning

Practically every neighborhood needs a good spare time serviceman. The day you enroll I start sending you Extra Money Job Sheets. They show you how to do Radio repair jobs that you can cash in on quickly. Throughout your training I send you plans and ideas that have made good spare time money for hundreds of fellows. I send you special equipment which gives you practical Radio experience—shows you how to conduct experiments and build circuits which illustrate important principles used in modern Radio sets. My Free Book tells all about this.

Find Out What Radio Offers You

Mail the coupon now for "Rich Rewards in Radio." It's free to any fellow over 16 years old. It describes Radio's spare time and full time opportunities, also those coming in Television; tells about my training in Radio and Television; shows you actual letters from men I have trained, telling what they are doing and earning; tells about my Money Back Agreement. MAIL THE COUPON in an envelope, or paste it on a penny postcard—NOW!

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MODERN MECHANIX

AUGUST
1937

Volume XVIII
Number 4

Circulation over 250,000

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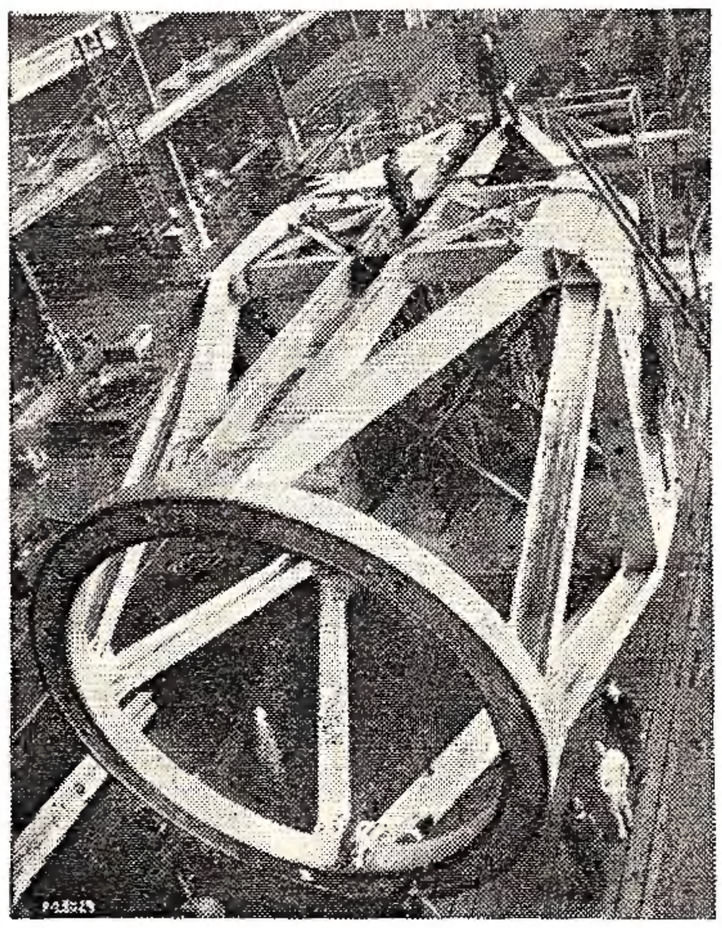

In an article — "Science Builds The Greatest Telescope"—John Edwin Hogg supplies interesting details concerning the gigantic 200-inch telescope being constructed for astronomical observations to be made from Mt. Palomar, Calif. The huge mounting for the telescope (above) is 60 feet long and has an outside diameter of 22 feet. Without optical parts, gears, or mirror cranes, mounting weighs 100 tons.

FOR WORKSHOP FANS

Among the many interesting projects included in the September issue will be—"Tiny Tot," a ¾-Meter Radio Receiver; A Midget Metal Hull Dinghy; How To Clean And Condition Firearms; A metal Humidor Pipe Rack; Making Photographic Name Cards; and other plans, suggestions, and practical workshop kinks.

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So life goes—like that. NOW is the only opportunity. NOW is the moment of success. NOW men decide—NOW men win or fail.

Are you one of the men who are wondering today what will happen to them tomorrow? Then remember this: *If you take care of today, tomorrow will take care of itself.* And one of the most important safeguards you can take is to be certain your *training* is modern . . . that you are adequately equipped to master the problems of 1937. Today, in almost every line of human endeavor, ambitious men are modernizing their training by spare-time study of International Correspondence Schools Courses. Their action is a guide to you — and NOW is the time to act! Complete information on any subject in which you are interested will be sent without cost or obligation. The coupon is for your convenience. Return it today.

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A frank man to PATENTS-INVENTIONS

THE world of invention moves on. About a hundred years ago people were saying, "There's nothing left to invent"—today we know that is one of the funniest things ever said. Just think what has happened in the last hundred years! Autos, radios, airplanes, and thousands of useful, practical devices for home, shop and office have been invented and put on the market. Inventors are constantly making the world a better place to live in. Did you see a notice in the paper that an obscure worker, Hans Wach, has invented a simple device to utilize exhaust steam on steam boats. *Already, the report states, the steam ship lines have saved more than $15,000 in fuel bills with his invention.* Almost in the same breath the Dept. of Commerce announces that it will soon test out a new non-crashable aeroplane, which the average man can learn to fly in a day, which will travel at 110 miles an hour and sell at the price of a cheap automobile. An unknown Seattle man has invented a robot to go 5,000 feet under the sea and recover millions and millions of dollars worth of gold lying at the bottom of the ocean since the days of the early Spaniards.

Remember this: For every outstanding big invention there are thousands of small, simple things for use in the home, the office, the factory, on the farm, on every sort of travel conveyance. Little articles like you find on the counters of a 10-cent store, hardware store, drug store, toy and novelty shop.

Many Little Ideas Have Big Commercial Possibilities

A person finds something he's using doesn't work right, or it's clumsy, or costs too much. He gets a happy thought. He improves the old Article. That's contribution to human progress. That's the way that many, many men have reached the goal of financial comfort, independence and even wealth. Most of the things millions of us use didn't come from the brains of engineers and physicists. They came from the mind and maybe the crude home work bench of Mr. Average Man, busily engaged in earning his bread and butter at whatever chance or circumstance has given him to do. The "little" man's opportunity as an inventor was never greater than it is today.

Who Are Inventors?

You'd be amazed at the men we contact in the course of a busy year. Most of them do not consider themselves inventors at all. During their work or leisure they get an idea. They work it out on paper. They get in touch with us about Protection. Did you know that a dentist invented the stock ticker, a school teacher the telephone, a farmer the typewriter, an artist the telegraph? Did you know that the crinkly hair pin—sold by millions now—came about because a husband saw his wife twisting the old-fashioned straight hair pin to make it stay in place? **Poor men who have no thought of invention now will be financially well-fixed in a few years because of a happy thought that the world could use to advantage.**

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Ask yourself these questions: How do the Patent Laws protect me? What easy steps can I take, without cost, to put myself in position to support my belief that I am the *first* man to think of *my invention*? Is a Patent worth the cost? Do I need a model? Should I try to sell my invention before I have it Patented? Is there any safe, business-like way to secure financial help? If I do apply for a Patent how shall I reach people who can market my invention? Can I protect and sell an improvement on some invention that has already been patented? These are but a few of the questions which usually confront the average man. You need the answers! **YOU CAN HAVE THEM**, without cost, trouble, or delay.

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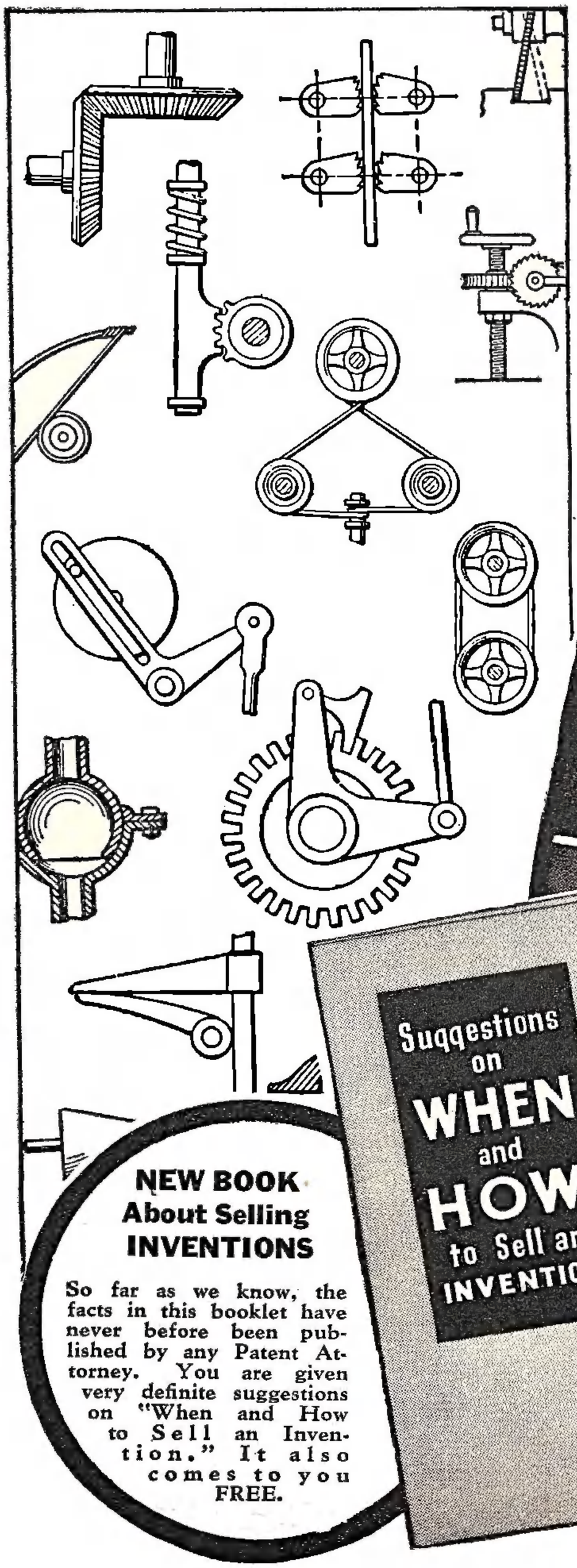

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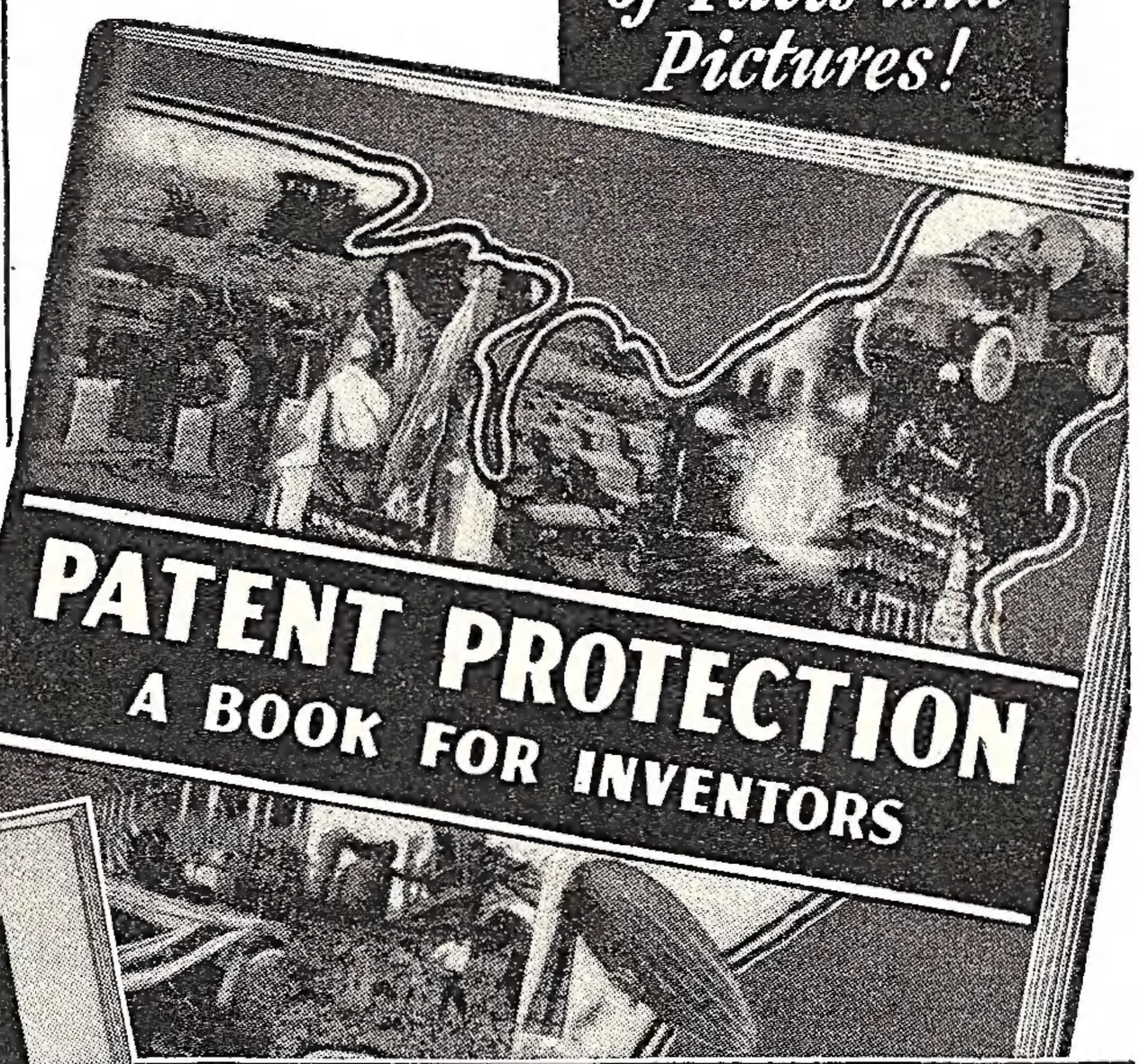

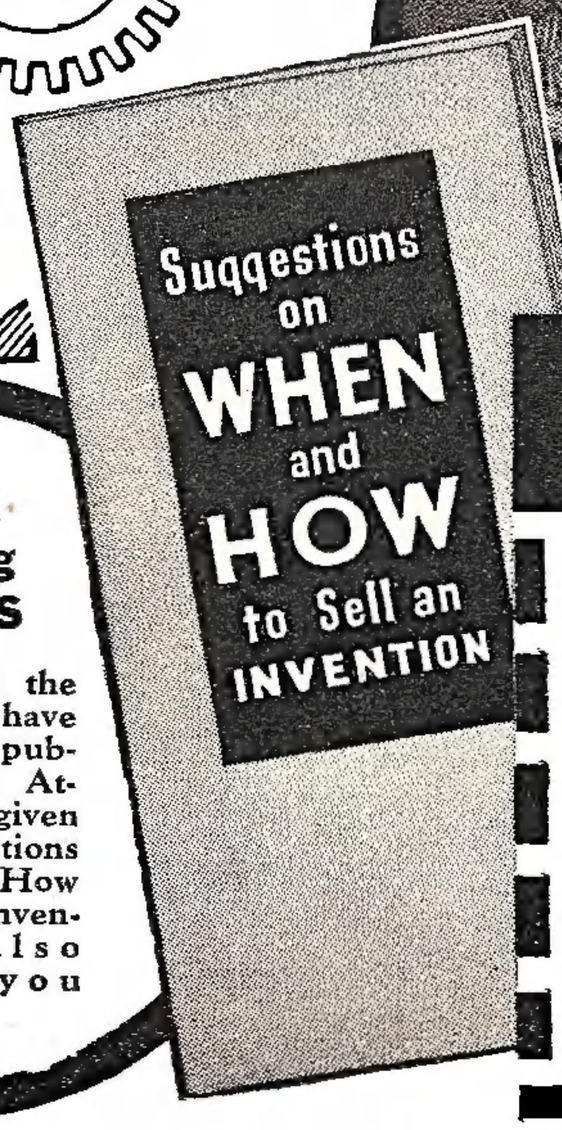

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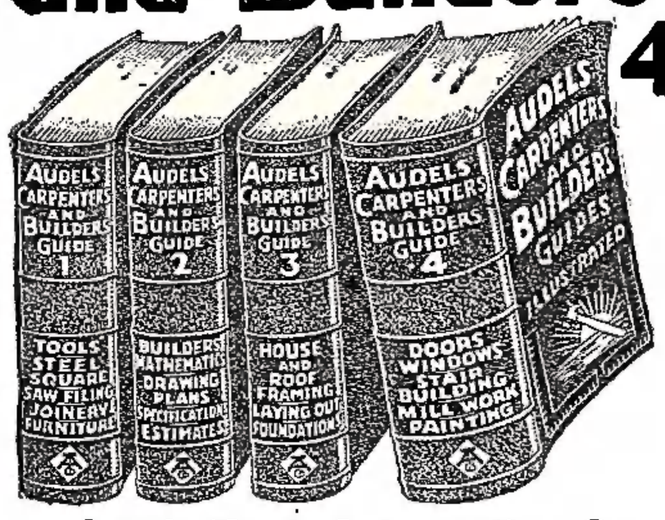

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The leaders of the next ten years will largely be determined in the next ten months. Will you be one of them?

Will You Be Clerk or Manager
Ten Years from Now?

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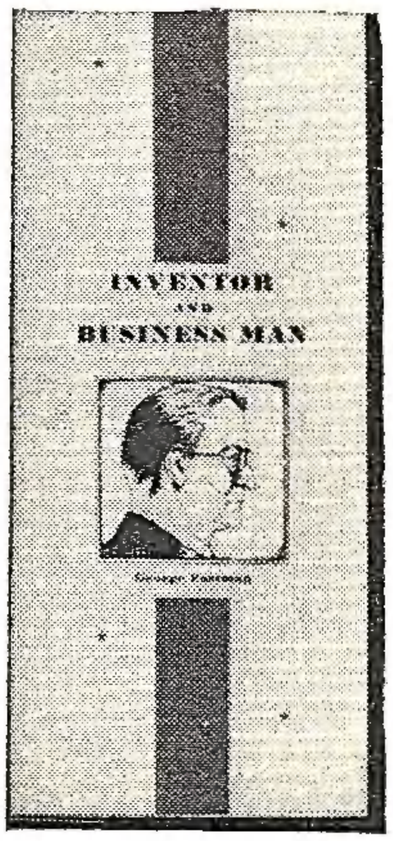
HOW OTHER INVENTORS GOT STARTED



The list of men who succeeded in invention with only a poor boy's start is a very long and noble one. Poverty, hardships, lack of friends, distance from the market—these could not hold back Bell, Edison, Eastman, McCormick, Whitney and others. Everyone cannot succeed. But every man can try. Courage, sacrifice, and hard work may bring you a measure of the success these men had. Lack of mechanical ability is not a serious drawback. You can always get someone able to build a model, draw a detailed design, or otherwise materialize your invention for you. The big drawback is discouragement.

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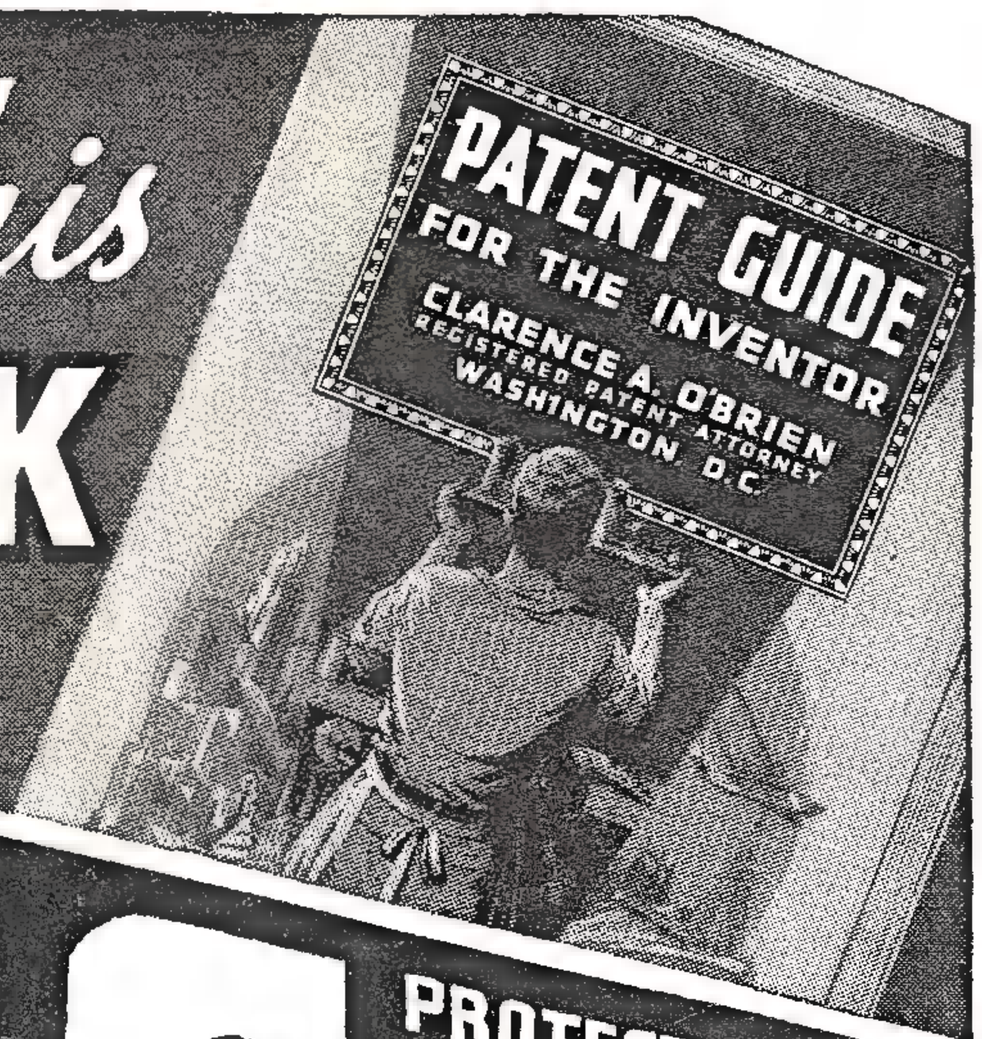

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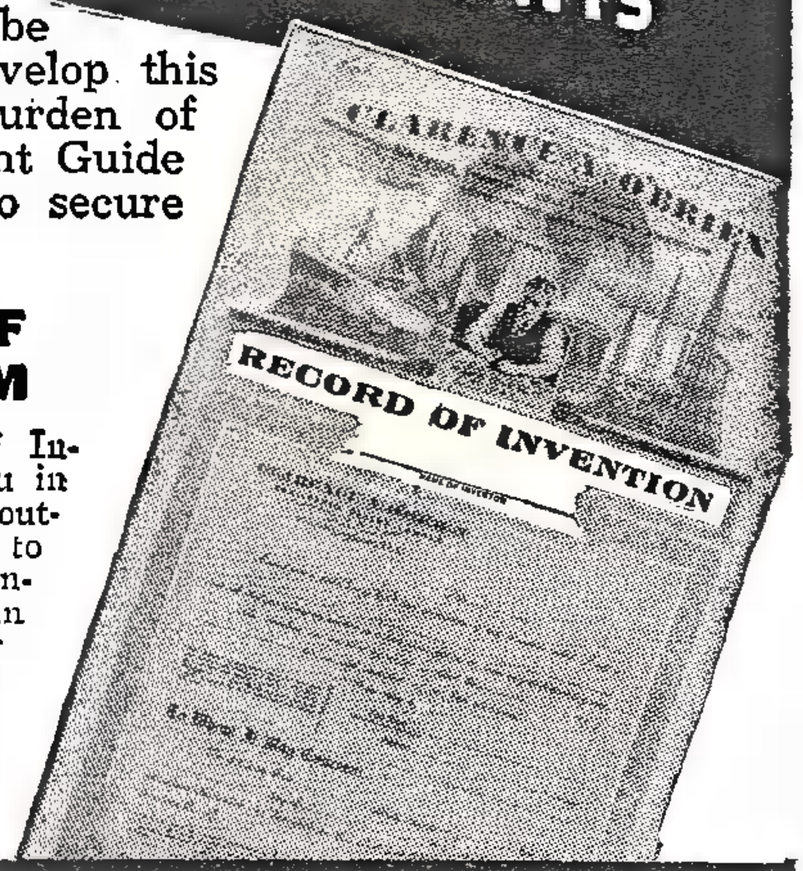

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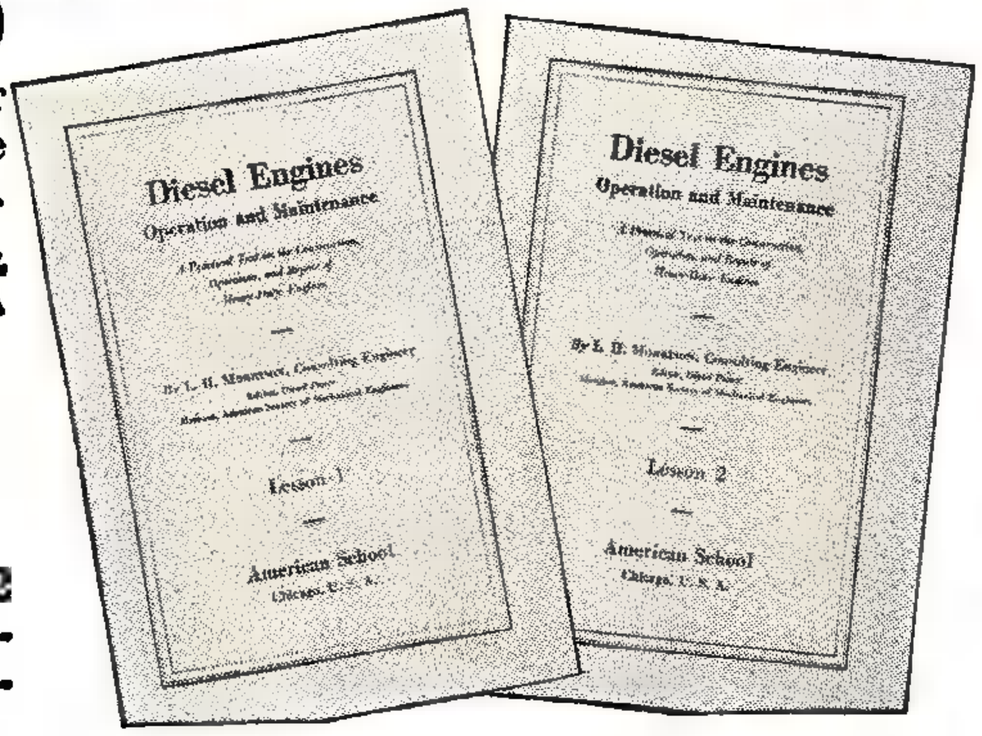

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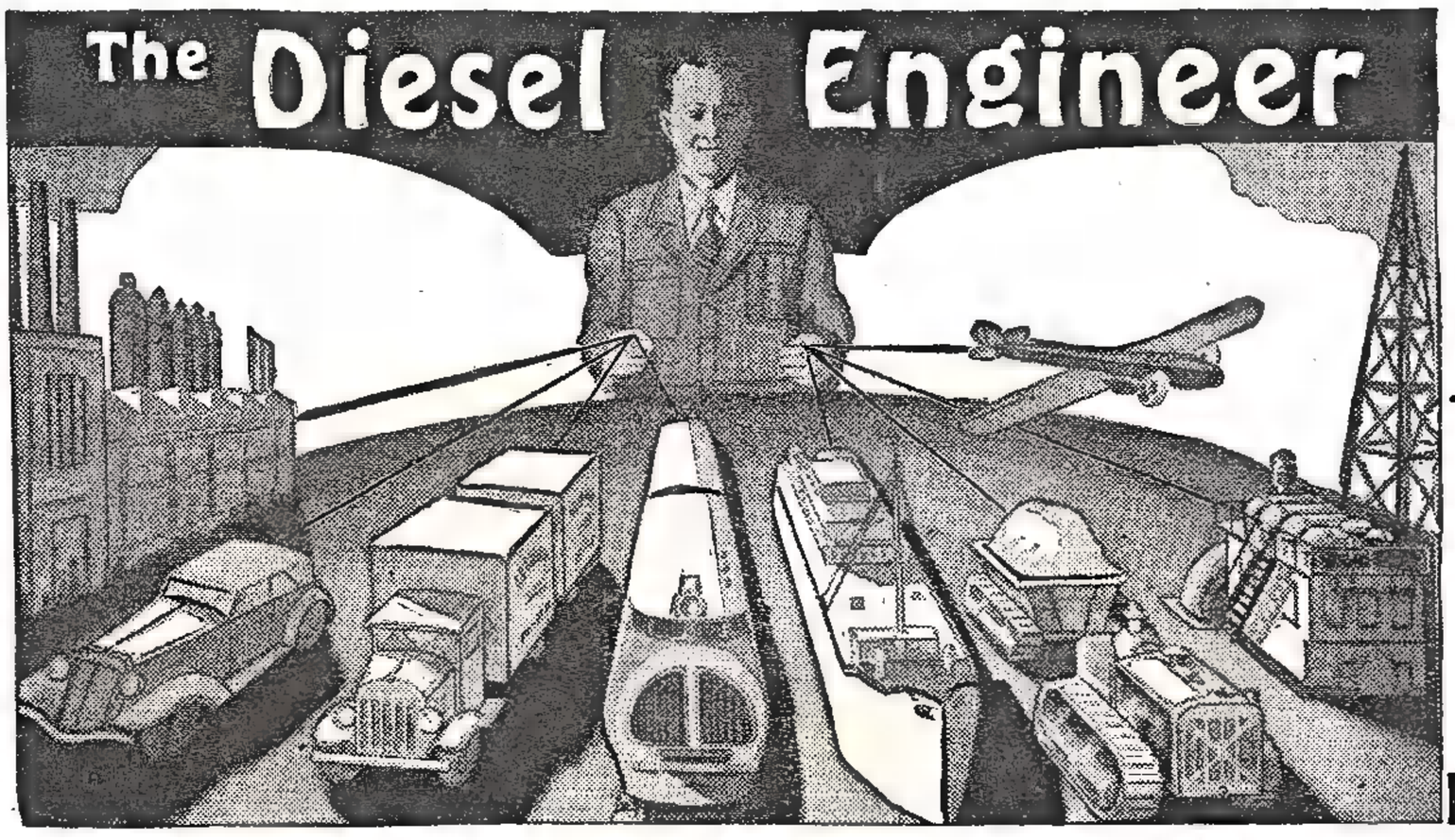

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Random Chips from

This 25-passenger sightseeing boat (top) was constructed by H. G. Meigs, of Milwaukee, Wis. Lower photo shows how paddle wheels are attached to auto rear-end to propel the craft.

WE WISH to remind all readers that letters and photos relating to projects completed in home workshops are *always* eligible for entry in the monthly Editor's Workbench contest. There is no time limit, contributions receiving careful consideration as soon as received in the MM office. A monthly selection is made from the available photos, a prize of $5 being awarded to the reader who, in the opinion of the editors, sends in the most interesting photo and letter. Prizes of $3 each are awarded for all other photos published in the Workbench each month. Send in a photo and letter describing projects you have completed.

***

A letter describing an unusual project was received from H. G. Meigs, of Milwaukee, Wis., who was awarded this month's first prize of $5. His letter reads:

Dear Editor:

I thought you might be interested in a sightseeing boat which we built, so I am sending you photos of it. The boat has a speed of 12 m. p. h. and is very popular with visitors to the lake resort where the boat is kept. It has a draft of only five inches.

The motive power consists of an automobile engine and transmission. The rear end of an auto is mounted on a framework so that wooden blades attached to the rims of the wheels can propel the craft. An automobile steering wheel is mounted by the driver's seat, having a large spool attached to the bottom of the shaft in the hold. A flexible cable runs from this to the rudder.

H. G. Meigs.

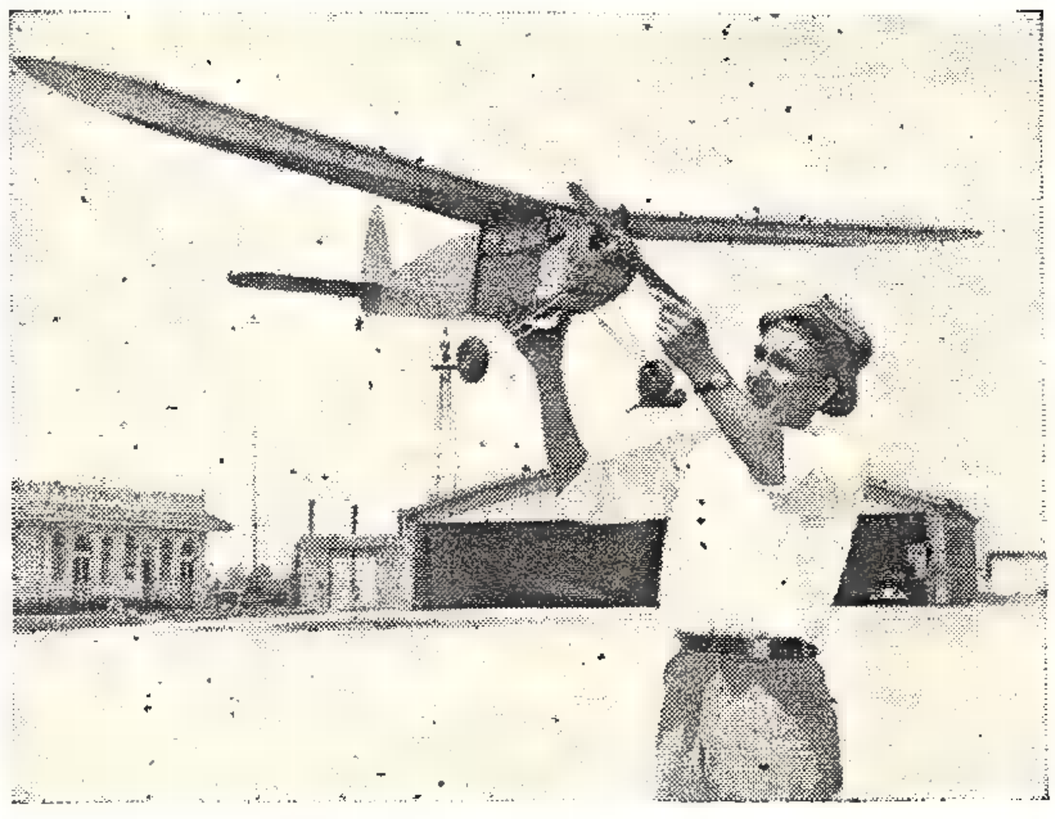
Reader Meigs is to be complimented for completing such a novel and practical project.

***

An award of $3 was sent to Wendell Lalley, of Monroe, La., for his letter and photo describing an attractive "gas" model airplane. He says:

Dear Editor:

I am sending you a photo of my "gas" model airplane. Although I have built many rubber-powered models, this is the first "gas" model I ever tackled. It has a span of 7 feet, weighs 4¾ pounds, and is powered with a motor of one-fifth horsepower.



Powered by a miniature gasoline engine of 1/5 horsepower, this model plane has a 7-foot wingspan. Wendell Lalley, who built the model, prepares to test its gliding qualities.

the Editor's Workbench

I enjoyed the "gas" model article that appeared some time ago. Why not give us some more plans for "gas" models? I would also like to correspond with readers who are interested in such models.

Wendell Lalley.

Lalley's model looks like a well designed and well constructed one. We hope he will build the Bellanca gas model described (final installment) in this issue.

***

This is the season for midget racers and a letter and photo received from James Webb, of Attwood, Ill., telling of his speedy little auto was awarded a prize of $3. He says:

Dear Editor:

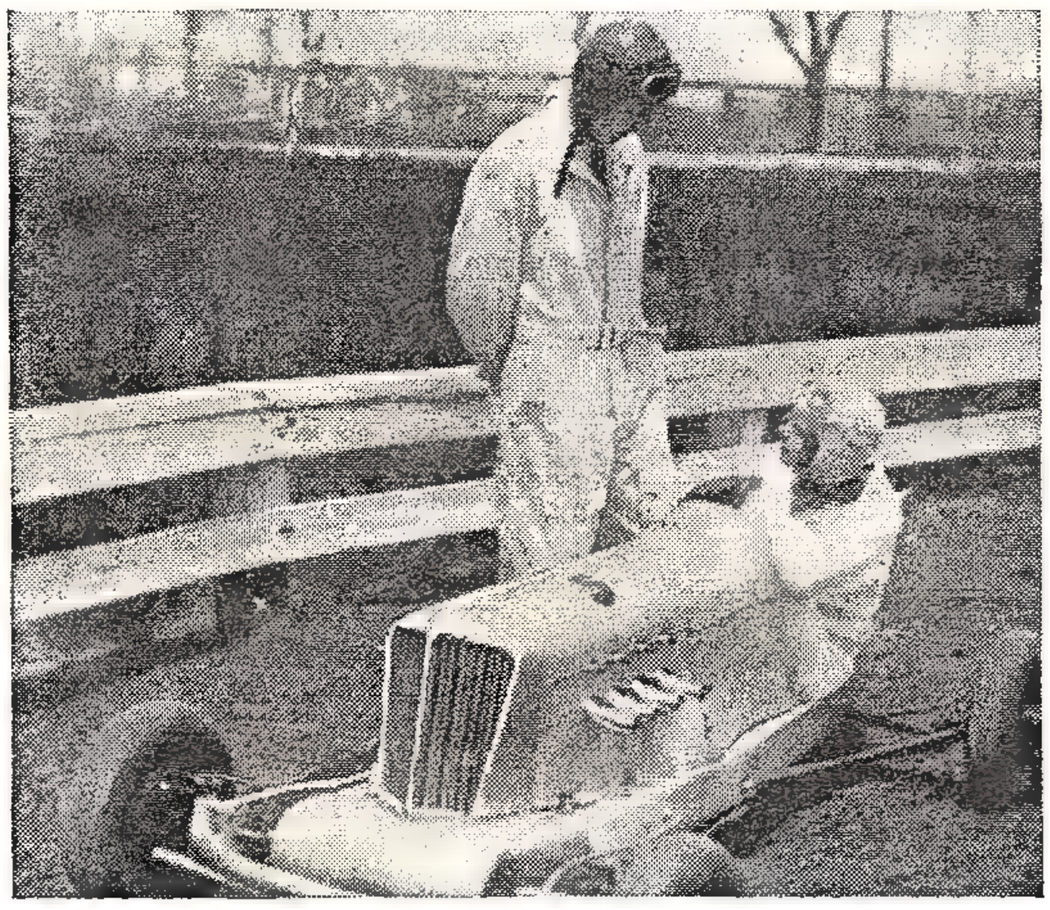
Enclosed is a photo of a midget racer that a pal and myself built. We want to tell you how pleased we are with your magazine for we get most of our plans from it. We are now planning to build the sailing cruiser "Buddy". Good luck to MM.

James Webb.

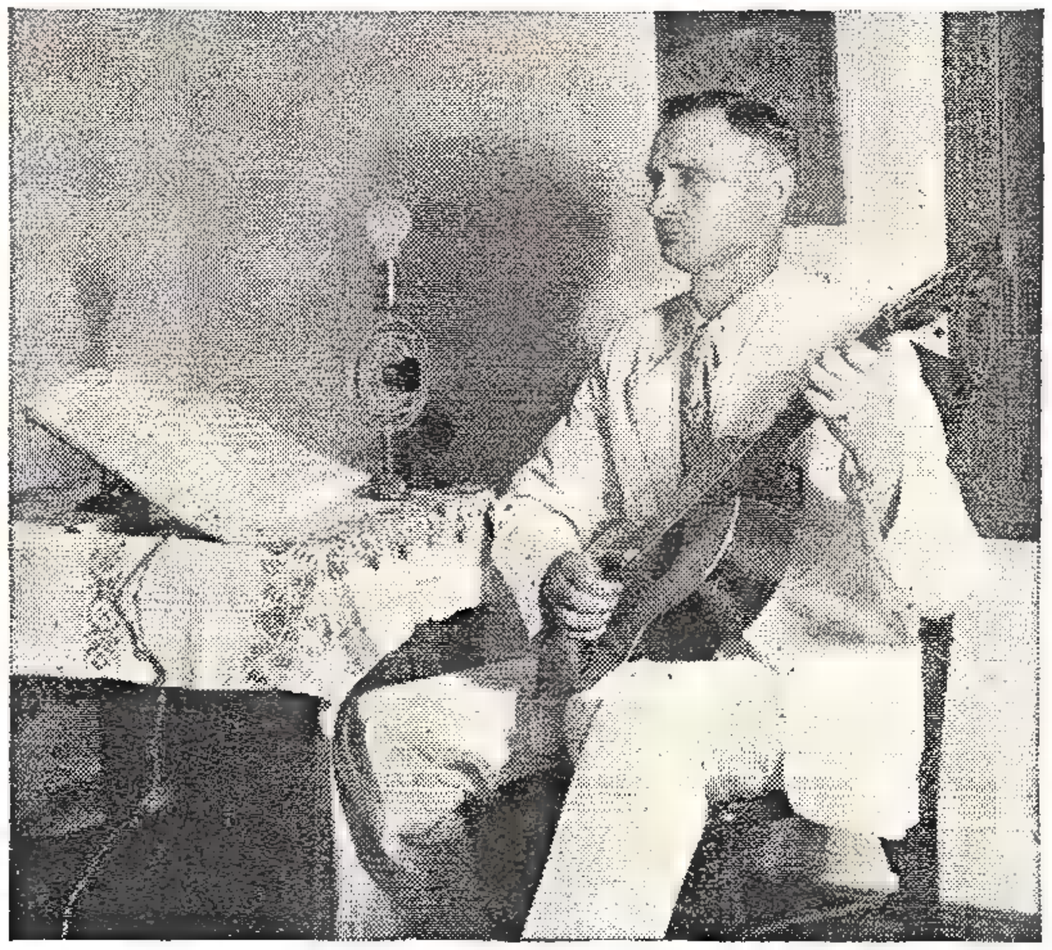
While Webb neglected to supply details concerning the size, power, etc., of his tiny racer, we awarded him a prize on the basis of its appearance alone.

***

Novel in appearance and utility is the project described in a letter from W. Posniak, of Tampico, Mexico, which won an award of $3. He writes:



Midget autos still continue to intrigue MM workshop fans. This metal-clad racer built by James Webb, of Attwood, Ill., was awarded a prize on basis of its appearance alone.



Music played by W. Posniak, of Tampico, Mexico, is picked up by the microphone lamp he built and emanates from small radio set nearby, serving to entertain friends in novel manner.

Dear Editor:

I am sending you a photo of the microphone lamp that I constructed. The device is 12 inches high without the light globe, the microphone ring having a 6-inch diameter with a center disc 3⅞ inches in diameter.

The photo shows me broadcasting over the microphone lamp, the music being heard from a small radio set located nearby.

W. Posniak.

A microphone lamp provides much entertainment and constitutes a project that has appeal to all radio fans.

***

From Oteen, North Carolina, came a letter written by C. E. Self which was awarded a $3 prize. It reads:

Dear Editor:

I am enclosing a picture of a miniature railroad caboose that I built from discarded match sticks. I hope you will consider the project in the Workbench contest.

The walls of the caboose are constructed of burnt match sticks. The roof is covered with the inside of the boxes that the matches were packed in. The wheels, steps, oil boxes, and draw heads are made of wood, whittled to proper shape.

Four bunks are features of the caboose interior, while four seats are located in the cupola, all of which are upholstered in leather. The windows are made from old X-ray plates. The caboose is 16 inches long and

[*Continued on page* 16]

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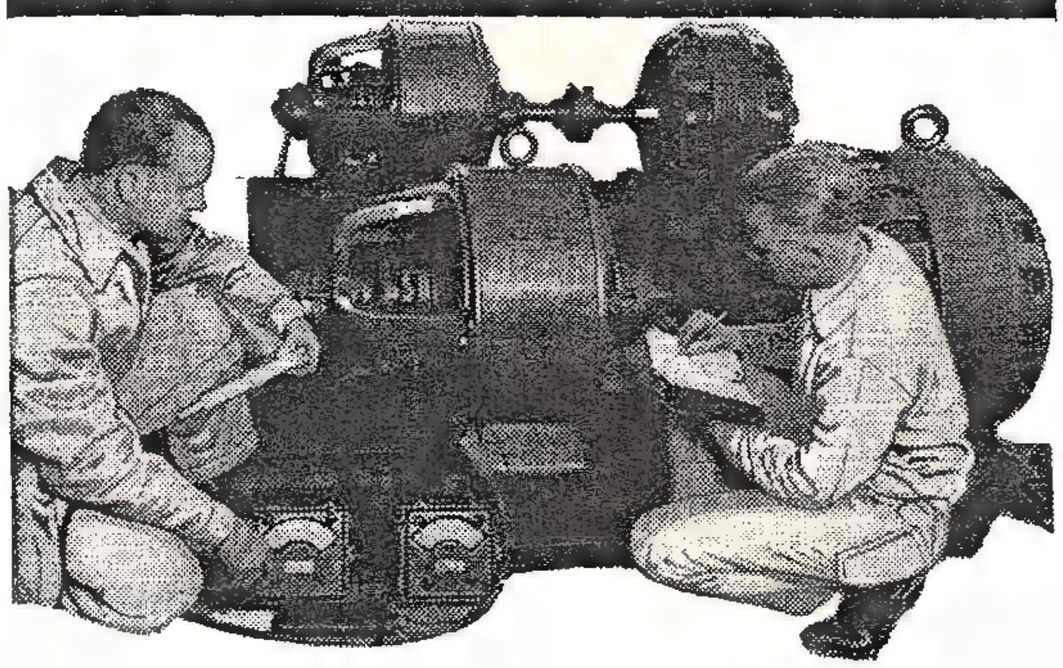

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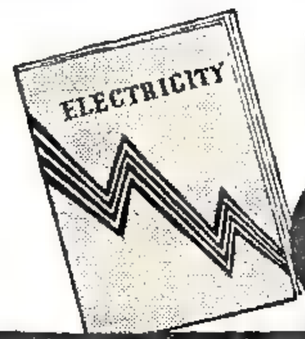

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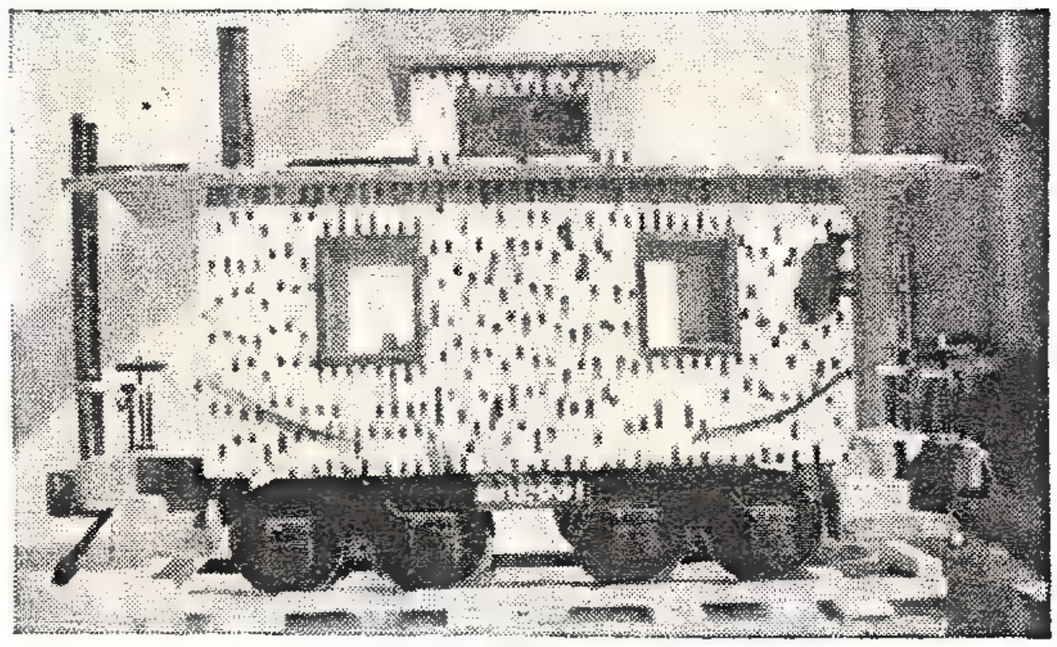
Editor's Workbench Chips

[*Continued from page* 15]



Displaying unusual patience and skill, C. E. Self, of Oteen, N. C., constructed this model caboose, using more than 4,000 match sticks. Wheels, steps, etc., were whittled from wood.

7 inches high, and incorporates more than 4,000 matches in its construction.

C. E. Self.

We admire Mr. Self's patience and skill in creating the novel caboose and hope he will let us see photos of other projects he has completed.

***

Modelers interested in particular types of modeling frequently desire to correspond with other readers having similar interests. MM will gladly print letters from readers who desire to locate a "Pen-Pal". Send in your letter, but be sure to print your name and address clearly.

The value of correspondence with other readers who are interested in the same subject cannot be overrated. Through an exchange of ideas, designs, kinks, etc., a more thorough knowledge of any hobby can be acquired, to say nothing of the friendships started, many of which last throughout a lifetime.

***

Boat project letters and photos continue to outnumber all other types. George C. Espersen, of Silver Creek, N. Y., sent in a letter that was awarded a $3 prize. The letter reads:

Dear Editor:

I am enclosing some photos of "Nomad", which was constructed from MM plans. It is framed with yellow pine and planked with mahogany, finished natural.

"Nomad" sails very well with one or two persons aboard, being very stable and showing good speed. I certainly recommend MM plans to all persons contemplating the construction of a boat. They are very clear, easy to follow, but most important, thoroughly tested designs.

George C. Espersen.

Thanks for the compliments on the MM plans, Espersen. The trimness of your craft is eloquent testimony as to your craftsmanship, and we are pleased that you selected MM plans.

[*Continued on page* 18]

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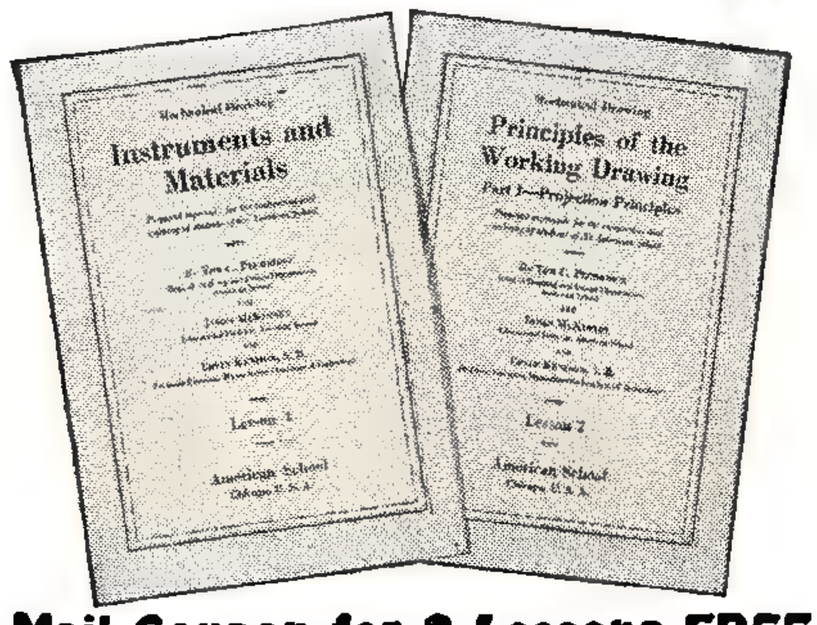

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Editor's Workbench Chips

[*Continued from page* 16]

Sailing well with one or two persons aboard, the "Nomad" sailboat shown above was built by George C. Espersen, of Silver Creek, N. Y., from plans in popular MM boat book.

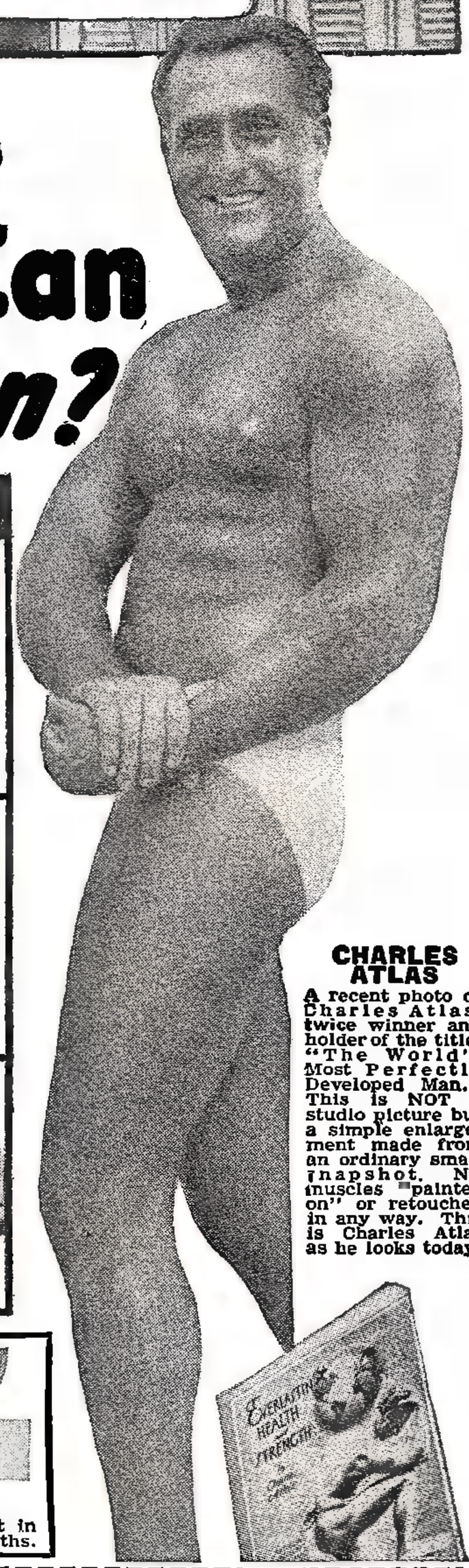
What is *YOUR* opinion concerning the much debated question as to whether or not home craftsmen aviation fans should be permitted to build and fly home-built aircraft? Do you believe that existing regulations should be eliminated or modified so that groups of aviation enthusiasts could band together to build and fly light planes, thus enabling ambitious fellows to indulge in the sport of flying at minimum cost? Does the fact that many finely constructed home-built aircraft are being operated in some states make you yearn for similar "considerate" air legislation in your state?

MM would like to hear from all readers interested in the construction of light planes and will print as many letters as possible concerning opinions on the elimination, modification, or continuance of present government regulations relating to home-built aircraft. Send in your letter and include a photo of yourself, if possible.

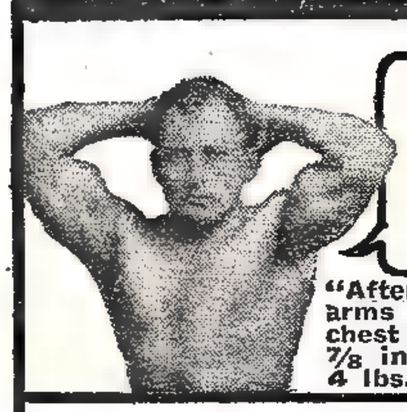
In addition to printing the letters of readers on this controversial subject, MM plans to feature photos and details of home-built aircraft that are being operated in states where regulations permit such activities.

Some one is killed in one out of 61 automobile accidents, if the automobile is traveling no faster than 20 miles an hour; but if the car is going 50 miles or faster, the ratio is a death to every 11 accidents.

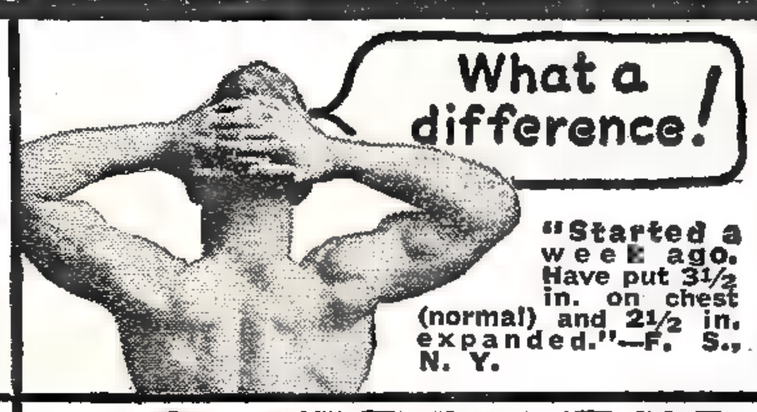
Will You Give Me 7 Days to PROVE I Can Make YOU a *New Man?*



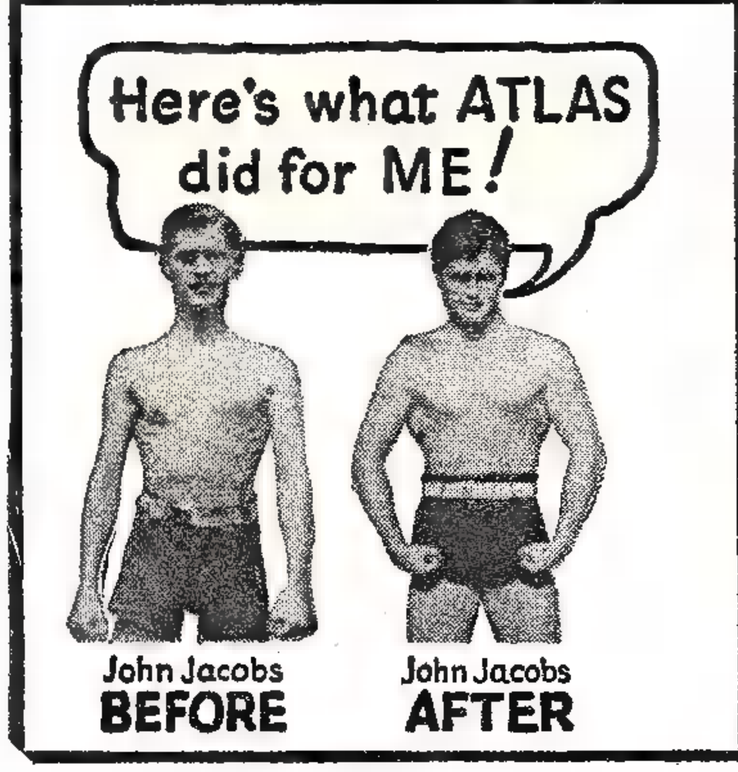
LET ME START SHOWING YOU RESULTS LIKE THESE



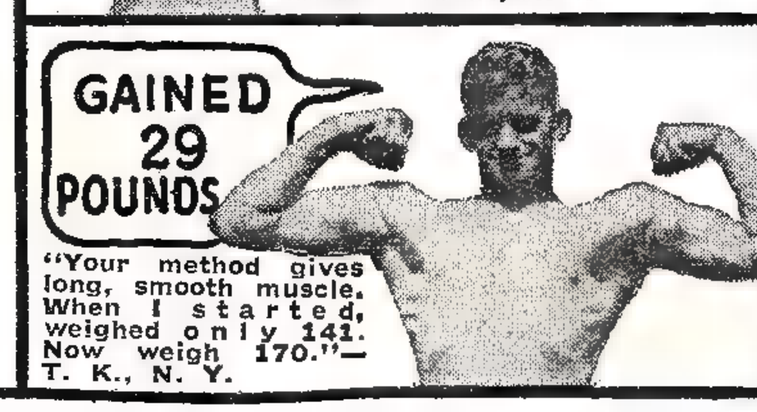
"After ONE WEEK my arms increased 1½ in., chest 2½ in., forearm ⅞ in., and I have gained 4 lbs."—C. S. W., Va.



"Started a week ago. Have put 3½ in. on chest (normal) and 2½ in. expanded."—F. S., N. Y.



"Am sending snapshot of wonderful progress. Certainly recommend you for quick results!"—W. G., N. J.



"Your method gives long, smooth muscle. When I started, weighed only 141. Now weigh 170."—T. K., N. Y.

CHARLES ATLAS

A recent photo of Charles Atlas, twice winner and holder of the title, "The World's Most Perfectly Developed Man." This is NOT a studio picture but a simple enlargement made from an ordinary small snapshot. No muscles "painted on" or retouched in any way. This is Charles Atlas as he looks today!

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115 East 23rd Street, New York, N. Y.

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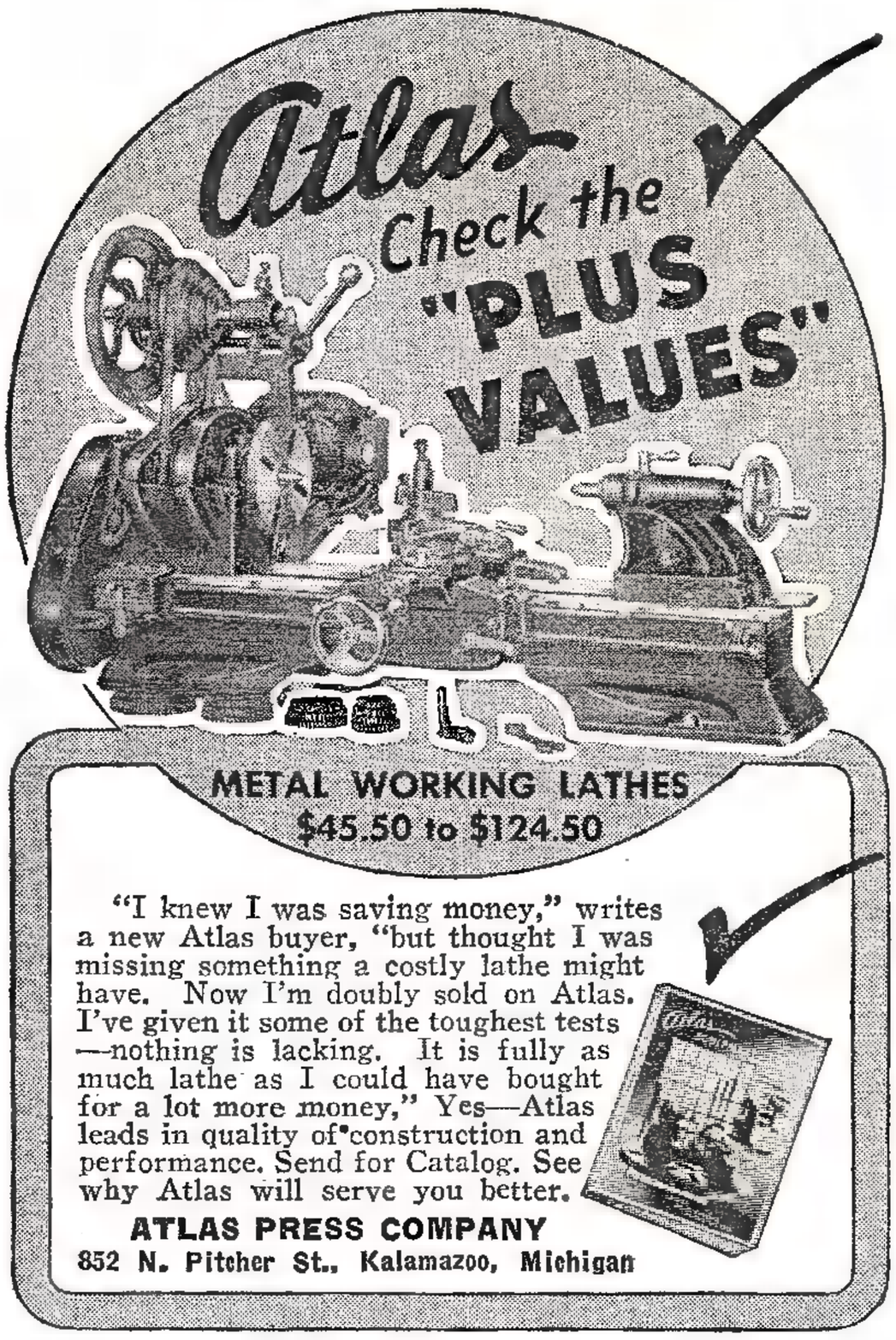
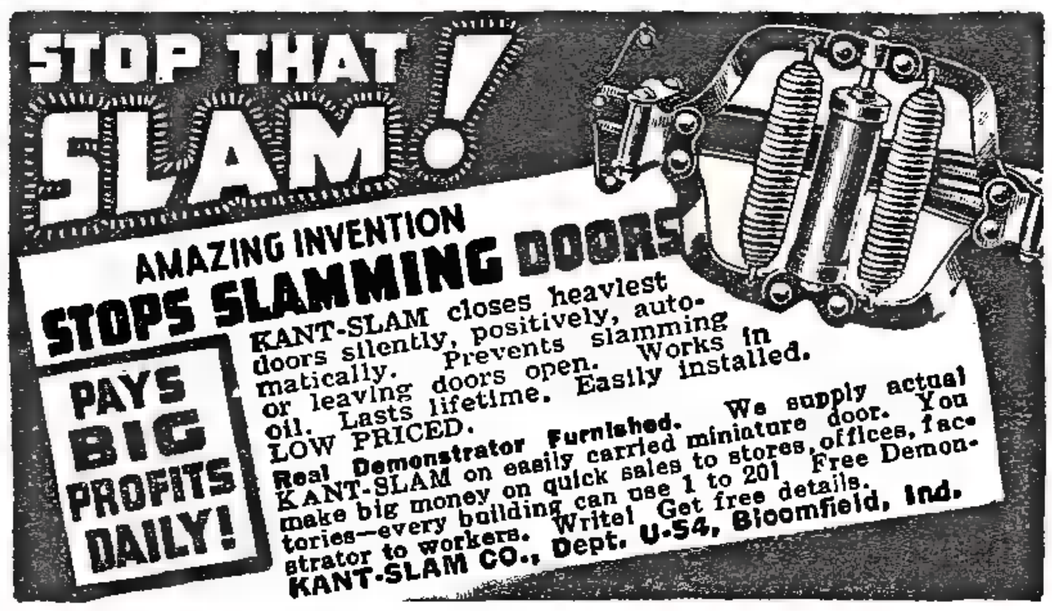
City.....State.....





Map "Curvimeter" Devised

A "CURVIMETER" device which enables hikers or motorists to determine the distance between two points on a map has been developed by a German manufacturer. Equalling a pocket watch in size, the device has a compass on one side and graduated scales and an indicating needle on the other.

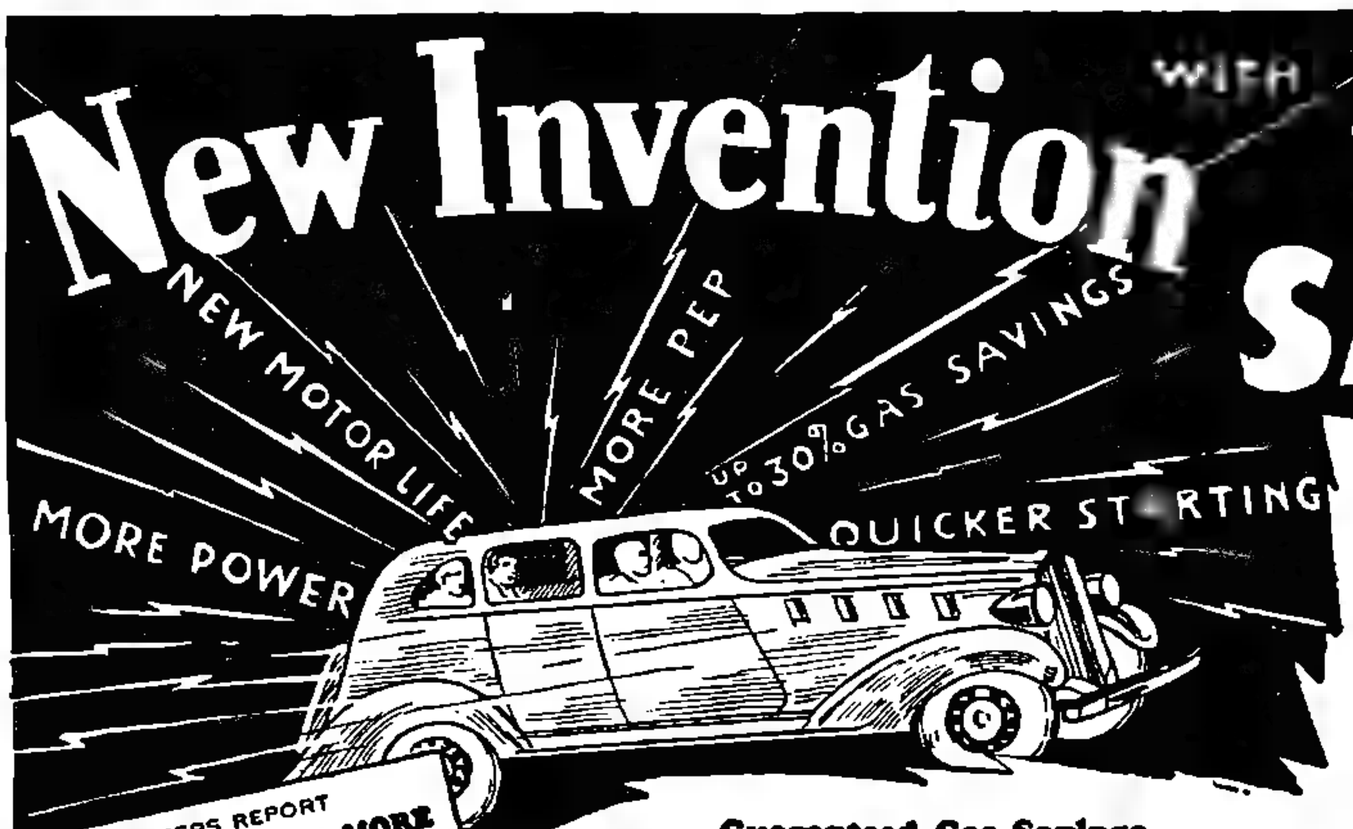
In operation, a small wheel attached to the base of the Curvimeter is run over the map, following the road line between the desired points. Glancing at the scales and needle of the device, the user can quickly determine the distance involved.

New Airplane Fuel System

VIRTUAL elimination of conventional aircraft engine carburetors and solution of the problems of carburetor ice and excessive intake heat are expected to result from a new type fuel system being developed by United Air Lines engineers. The system is considered so important that full details are being withheld at the request of military and naval aviation authorities.

The system will embody completely automatic mixture controls to compensate for changes in engine load and altitude conditions. A twin-engined transport plane has been equipped with the new fuel system and is being used to conduct actual operating tests of its efficiency. Work on the system started in 1931 and has been continued since then.

New Invention WITH SUPERCHARGE PRINCIPLE SAVES GAS



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"I have been placing VACUMATICS on expert mechanics' cars. All are well pleased."—*J. W. Donahue, W. Va.*

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VACU-MATIC proves itself on every car. It is guaranteed to give worthwhile gas savings, quicker pick-up, and more power or it costs you nothing. You can instantly tell the difference in added power and motor performance — you quickly notice the cash savings on gasoline.

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VACU-MATIC is constructed of six parts, assembled and fused into one unit, correctly adjusted and *sealed at the factory*. Nothing to regulate. Any motorist can attach VACU-MATIC in ten minutes. Once in, its only reminder is the surge of instant power and speed it gives to the motor and the savings it affords your pocketbook.

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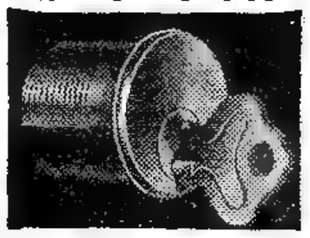

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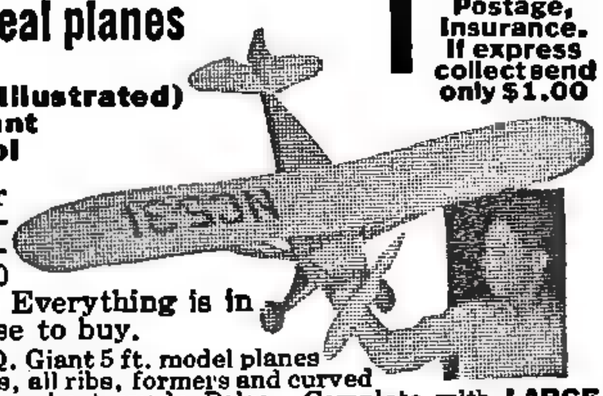

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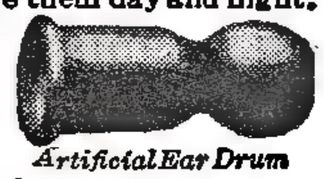

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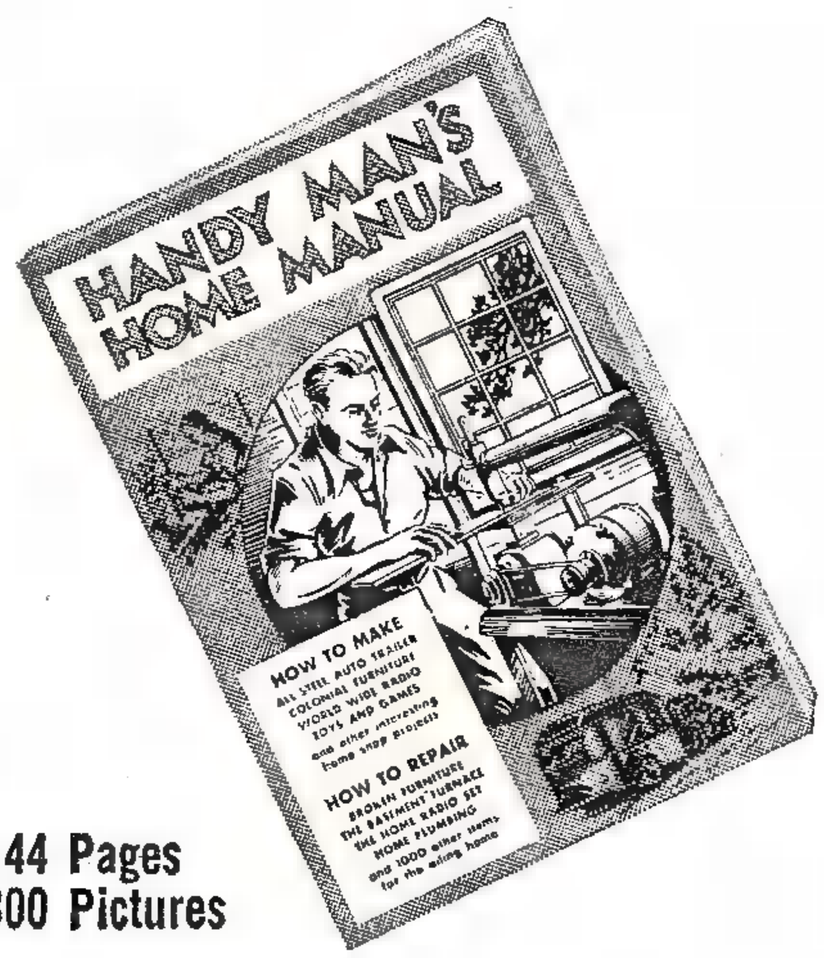

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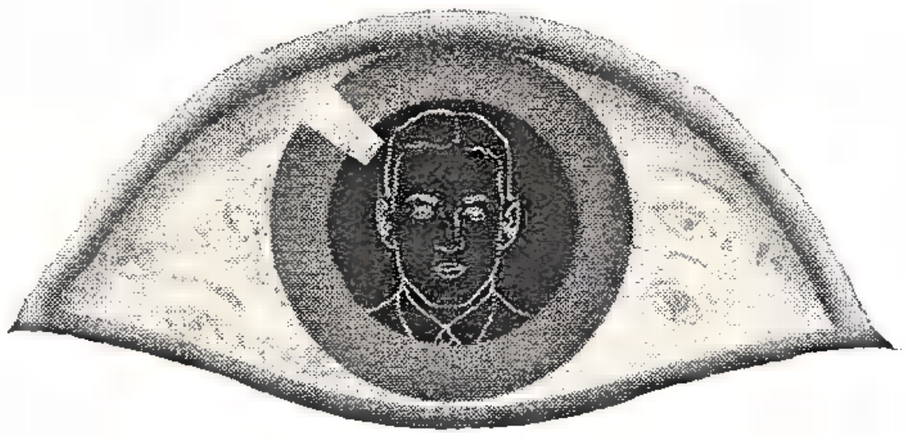

ALL EYES ARE ON THE MAN WHO LOOKS AHEAD

● A MAN cannot conceal ability. And the man who is determined to go some place and is doing something about it cannot conceal that either. His associates feel it and his superiors recognize it. The man who looks ahead knows the importance of training, and other men who have looked ahead and gone some place know that I. C. S. offers the right kind of training. Look ahead — mail this coupon!

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Editor's Note: Your questions will be answered personally and free of charge by MM experts provided they do not require special research or involve trade secrets. Names and addresses of manufacturers of new products described in this issue can also be obtained free upon request. Enclose a self-addressed and stamped envelope for reply. Address: Problems Editor, Modern Mechanix Publishing Co., 1501 Broadway, New York City.

PREVENTING SOLDERING IRON CORROSION

The copper tip on my electric soldering iron is constantly getting dirty. In fact, corrosion accumulates faster than I can remove it with a file. Since the soldering tip is very small, the metal is wearing away so rapidly that it will be of little use in a short while. Can you suggest some way in which I can prevent this excessive corrosion from taking place?—Andrew Vena, New York City.

If the tip of your small electric soldering iron corrodes rapidly the trouble can, in all probability, be traced to the wrong kind of flux. Acid soldering pastes or salts should never be used on the tip of small soldering irons. These irons were designed for light work only, therefore only rosin flux should be used since it is non-corrosive. For radio, electrical and other light soldering, a rosin core solder should be used. This solder, marketed in spool form, contains the flux in the hollow center of the wire solder. Not only is it very convenient to use, but it protects the tip of the soldering iron against excessive corrosion.

SUBSTITUTING DIFFERENT COILS AND CONDENSER IN SHORT WAVE RECEIVER

I am planning to build a simple one-tube regenerative receiver similar to the one which appears in the MM "Radio Builders' Manual," but would like to substitute a 100 mmfd. tuning condenser and matched set of coils for the 60 mmfd. condenser called for in the original circuit. Can I do this without effecting any radical changes to the original circuit?—Morris Maidy, Buffalo, New York.

If the receiver is, as you say, a simple one tube regenerative affair, you can substitute a 100 mmfd. tuning condenser and a matched set of coils for the condenser and coils originally called for in the plans which appear in the "Radio Builders' Manual." The use of the substitute condenser and coils will result in slightly sharper tuning, whereas stations can be more easily separated with the 60 mmfd. condenser as suggested in the original circuit.

BUILDING A TRACTOR FROM "T" FORD

In the Editor's Workbench department of the June issue there appeared a homemade tractor which interested me very much. Can you tell me where I might secure plans so that I can build a tractor similar to the one mentioned? —E. C. Van Zandt, Battle Creek, Michigan.

While plans are not available for building the tractor which appeared in the Editor's Workbench in the June issue of MM, plans are available on the building of a similar tractor from a model T Ford. This tractor is capable of handling heavy work since it employs both the original transmission and an auxiliary, the latter being salvaged from a four cylinder Dodge car. A novel feature of this Ford tractor is that it can be used with either tires or cleats. Its total cost should not exceed $25. Complete plans for building this tractor will be found in the "1937 Handy Man's Home Manual," copies of which can be purchased from Modern Mechanix Blueprint Dept., Fawcett Bldg., Greenwich, Conn., at 50c postpaid.

AUTOMOTIVE MEANING OF "TORQUE"

Will you furnish me with an explanation of the word "torque" as applied to automotive devices? I have noticed that automobile engines are claimed by their manufacturers to develop so many foot pounds per minute. How is this torque computed?—Rex Hockett, Caldwell, Idaho.

Torque is the product of force multiplied by the distance at which it is exerted from the center of rotation. When a manufacturer claims that his car developes 83 ft. pounds torque, he means that at a distance of 1 ft. from the center of the crankshaft the engine would exert a force of 83 pounds, or at a distance of 83 ft. from the center of the crankshaft the engine would develop only 1 pound.

To simplify this, let us suppose that a 1 ft. wrench were attached to the crankshaft of the car's engine and the wrench held firmly so as to stall the motor. In order to accomplish this, 83 pounds would have to be exerted in order to stop the engine. But by increasing the length of the wrench handle to 83 feet, the motor could be stalled by exerting only one pound of force.

PLAYING PHONOGRAPH RECORDS THROUGH RADIO SET

I would like to use my radio receiver for reproducing recorded music. Can you tell me how to connect up a phonograph pick-up to a radio?—F. E. Ulvinen, Aurora, Ohio.

A phonograph pick-up of the high impedance type can be connected in many radio receivers without making any changes to the wiring of the set. Connect one of the insulated wires, extending from the pick-up, to the plate prong of the receiver's detector tube. If the set employs both

a first and second detector, connect this wire to the second detector's plate prong. The remaining wire is then connected through a 25,000 ohm volume control to the chassis of the receiver. The volume control should include a switch so that the phonograph pick-up is disengaged when not in use.

MAKING AN AQUARIUM CEMENT

I am planning the construction of a glass fish aquarium and would appreciate some information regarding a suitable waterproof cement which could be used for fastening the corners in place. Can you furnish a formula that will meet my requirements?—Lyman Armstrong, Lexington, Tennessee.

For an aquarium of moderate size, automobile window glass is advised. This should be cut to the desired size and inserted in a frame formed from ½ by ½ inch angle brass. Solder the frame together and then insert the glass sides. Anchor these in position with a cement made from the following ingredients:

Litharge	3 ounces
Fine white sand	3 ounces
Plaster of Paris	3 ounces
Powdered rosin	1 ounce
Linseed oil and drier. Enough to form paste.	

Mix the first three ingredients together then dissolve the rosin in the linseed oil and add to make a paste. Last, add a small amount of drier and mix the resulting cement thoroughly before applying it to the glass. By first coating the metal corners with a sufficient amount of cement and pressing the glass sides into position the possibility of leakage is reduced to a minimum. If leaks develop later they can be quickly stopped by application of more cement.

CASE-HARDENING IRON AND STEEL

Can you furnish me with a formula for case-hardening iron and steel? I have a number of articles which I would like to treat in this manner, but do not know just how to proceed.—Alonzo Franklin, Dallas, Texas.

Case-hardening iron and steel is not difficult although due care should be exercised in mixing the chemical bath into which the article to be hardened is submerged. The formula for the bath consists of the following chemicals:

Table salt	20	parts by weight
Potassium cyanide	2	parts by weight
Potassium bichromate	0.3	parts by weight
Broken glass	0.15	parts by weight
Potassium nitrate	0.1	parts by weight

Powder the broken glass and mix it and the chemicals together thoroughly. Heat the metal to be hardened until it attains a dull red color, then submerge in a water bath to which has been added the hardening chemicals and glass. The metal to be hardened should not be overheated if best results are to be obtained. The metal hardening operation should be performed only in a well ventilated room. Be careful not to inhale the fumes.

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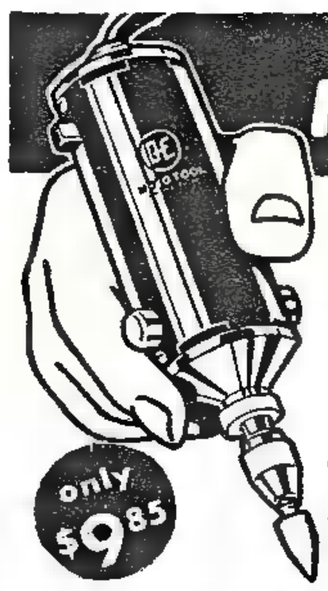

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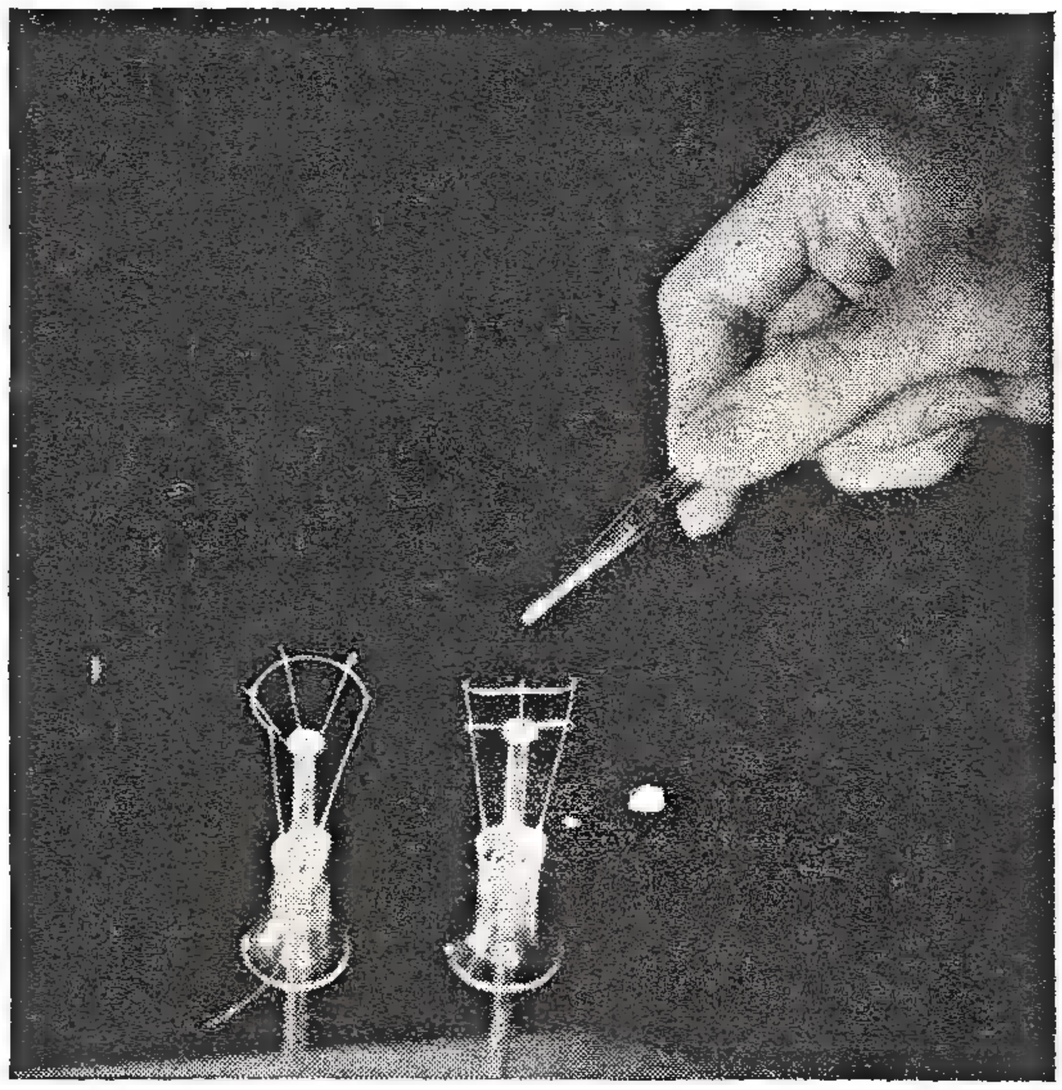

A NEW high-efficiency tungsten filament which will increase the light output of incandescent lamps 10% without using additional electrical current has been developed by a leading manufacturer, climaxing 24 years of continuous research. A "lighting bonus" or saving of over 16-million dollars to the public through use of the new filament is forecast.

When installed in a lamp, the new filament is mounted as a cross-bar between two lead-in wires, with one support in the center of the filament, instead of being looped around three supports, as was the practice formerly.

Since the effective length of the new filament, as shown in the accompanying photo, is only about one-half that of the old, there is much less cooling by the gas within the lamp, permitting the lamp to give 10% more light for the same amount of current. The gas employed in the new lamps is a mixture of nitrogen and argon.

Aero Clubs Increase In U. S.

FLYING clubs are on the increase in the U. S., according to a report issued by D. B. Thomson, director of the National Aero Reserve, one of America's leading semi-military aeronautical organizations. The report attributes the increase to the production of light planes of 40 h.p. which, through their low initial and maintenance cost, enable small groups of air-minded youths to secure training at low rates.

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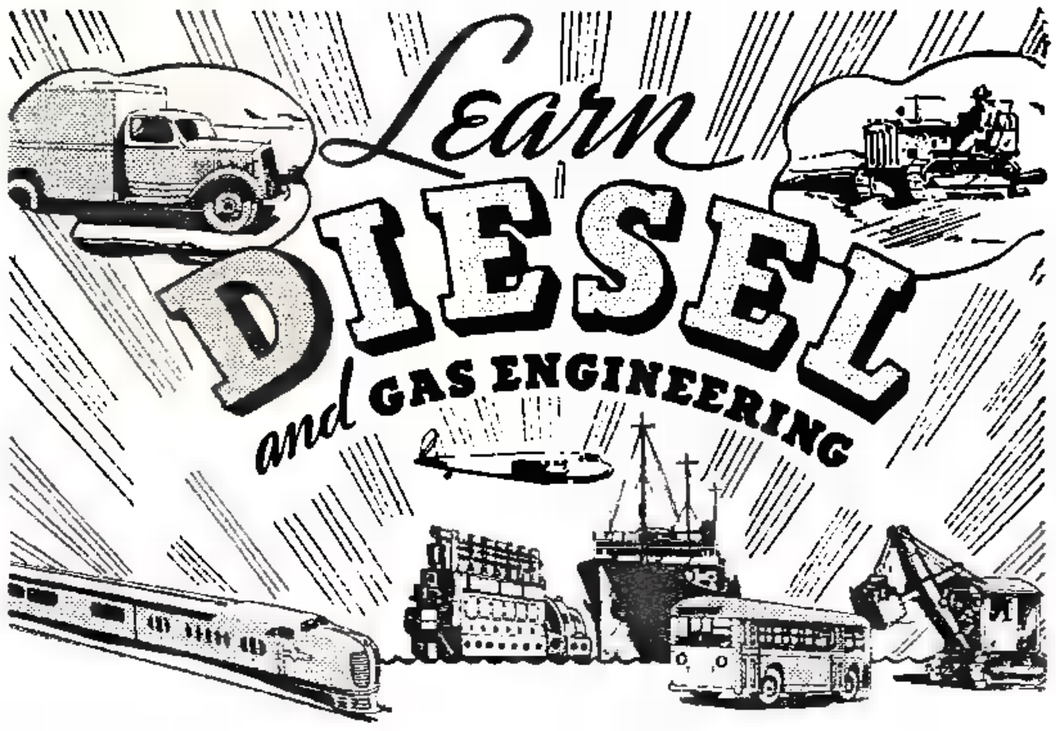

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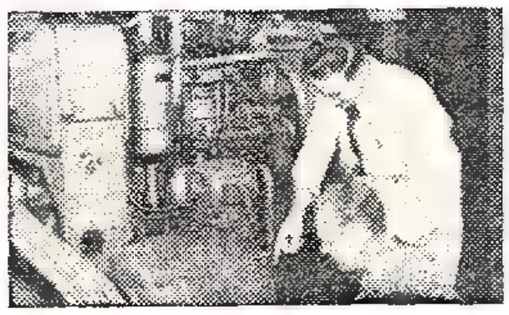

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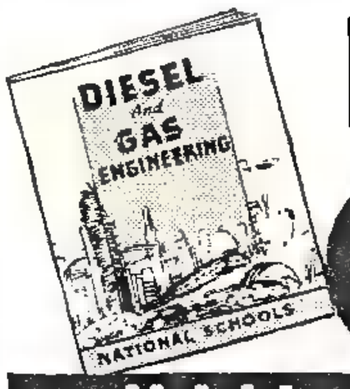

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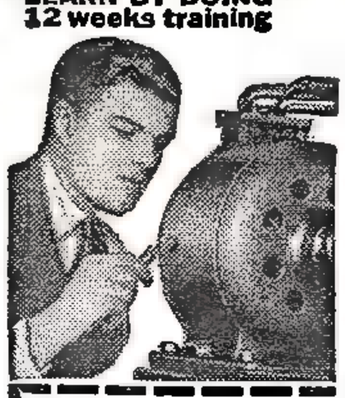

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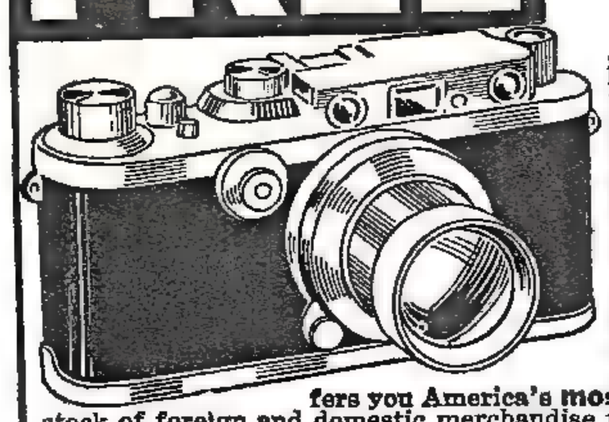

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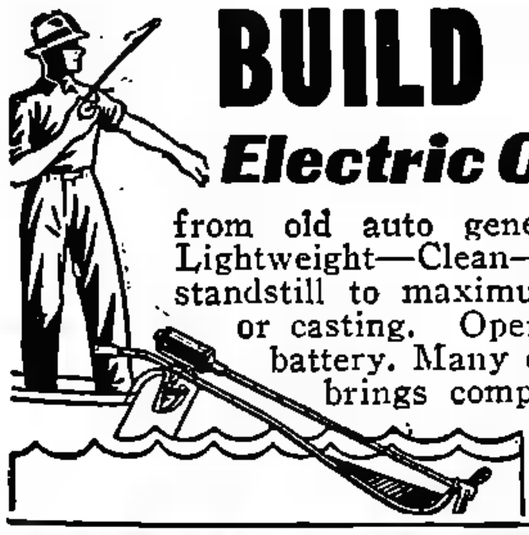

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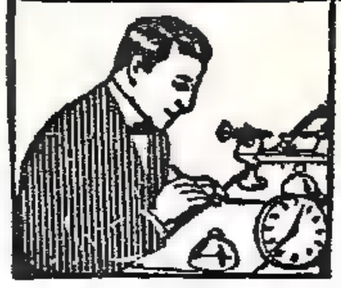

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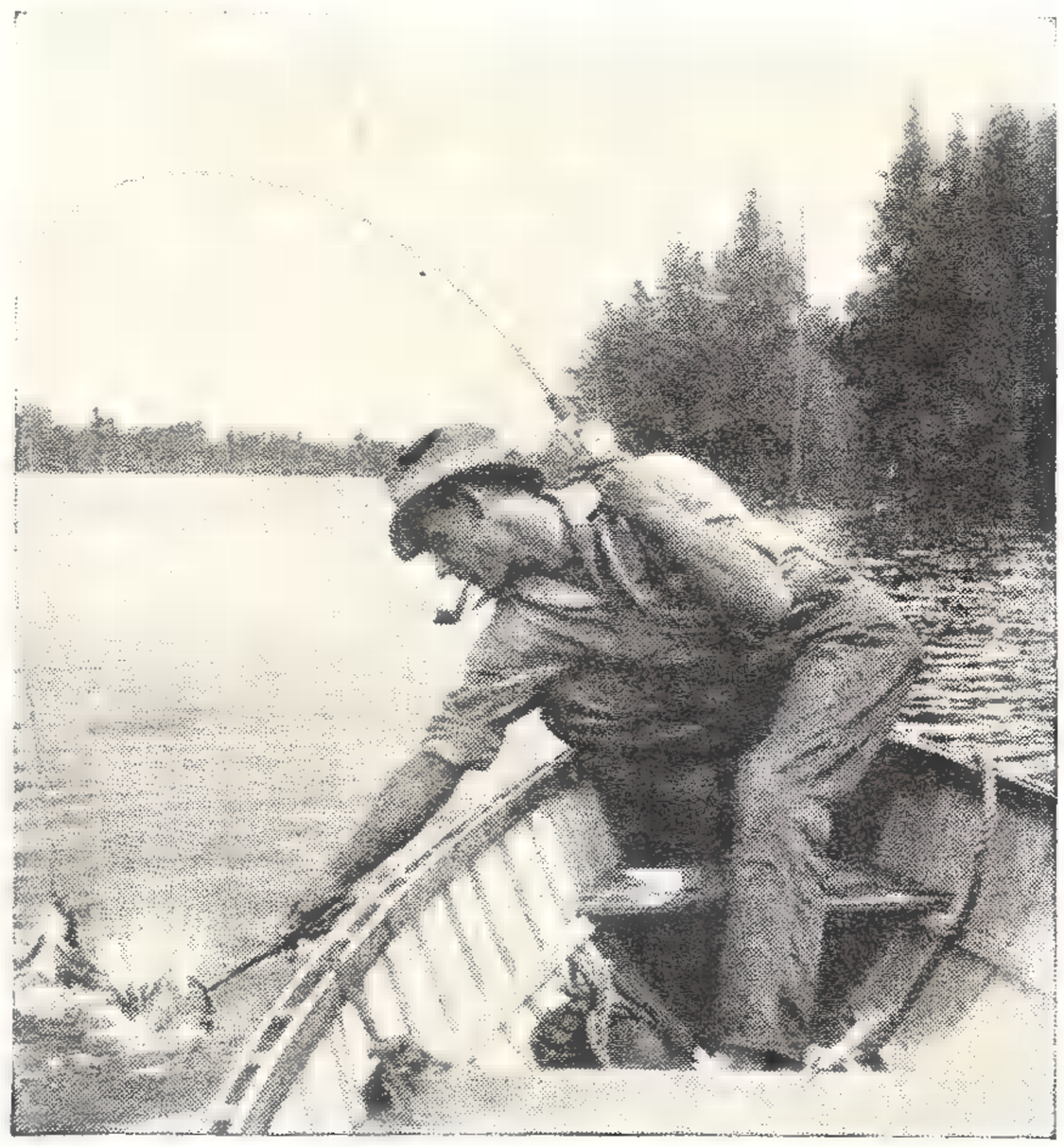

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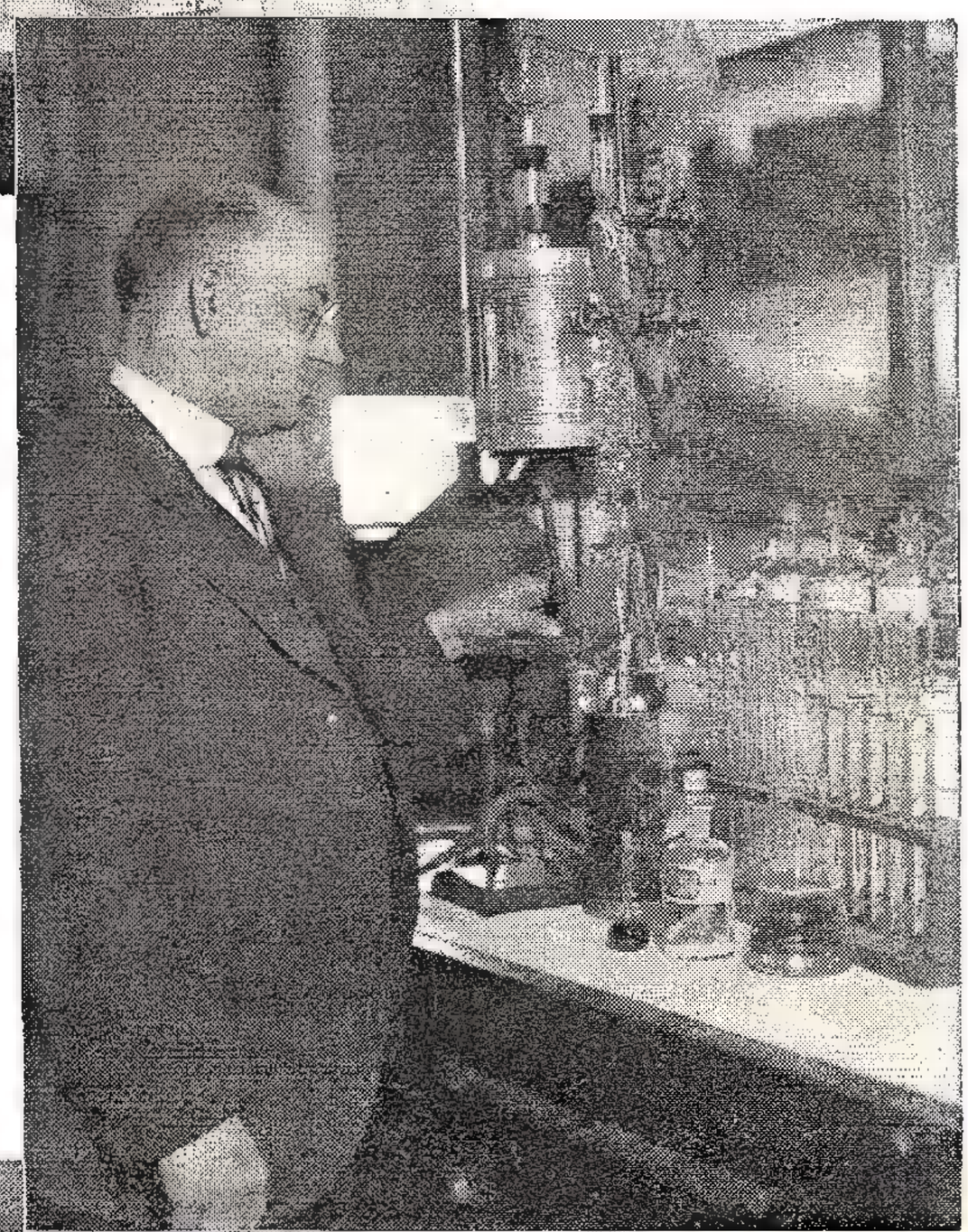
ADVENTURES

The U. S. Food and Drug Administration constantly labors to insure the quality of food products. Through the efforts of its field inspectors and expert laboratory technicians, the Federal bureau tracks down poisoned foods that constitute a threat to the nation's health. Left — A Federal chemist using special apparatus to determine the condition of canned goods.



by James Nevin Miller

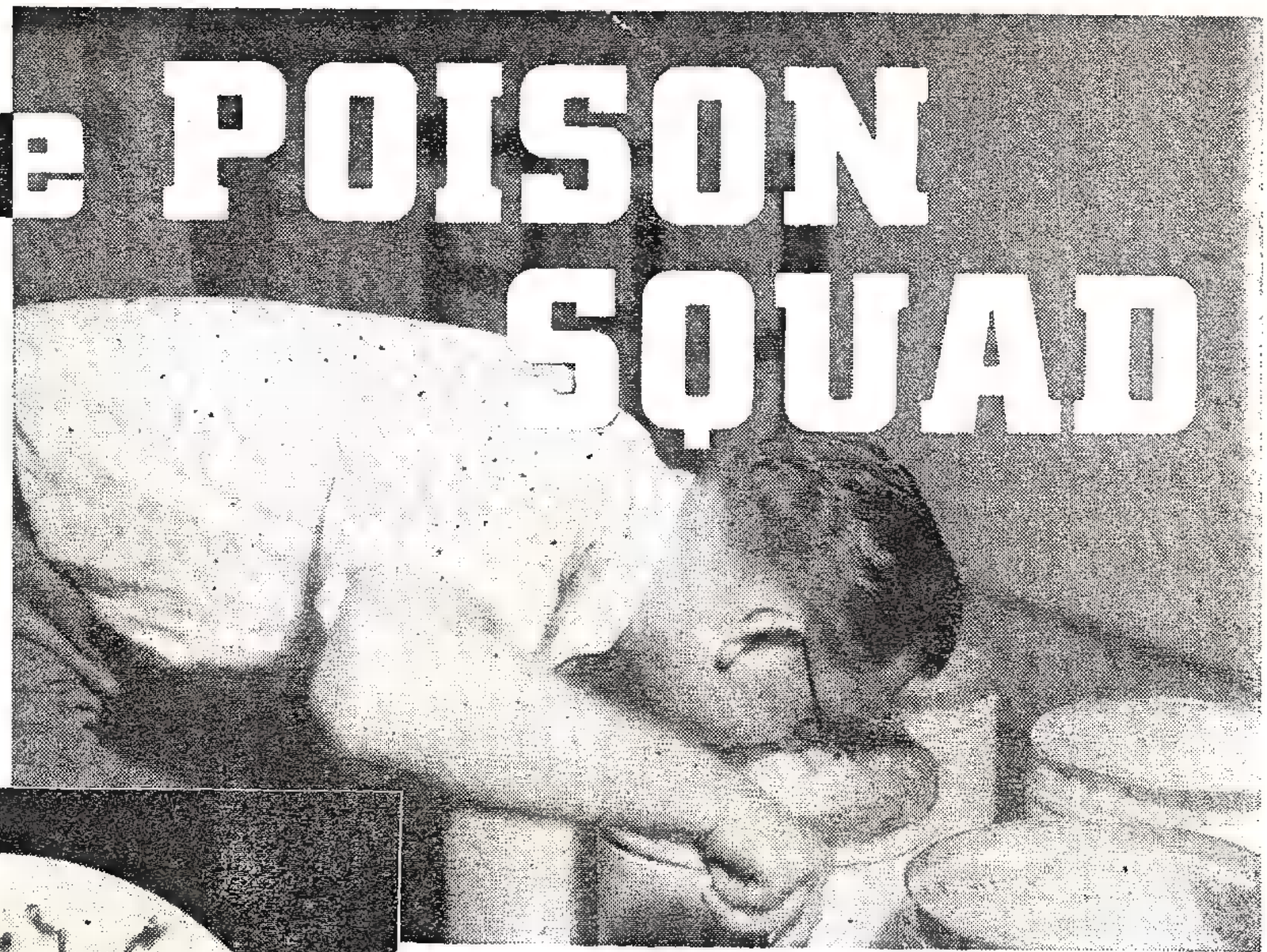
IN THE city of White Plains, N. Y., not so long ago, more than 700 people suddenly were stricken with a mysterious ailment. City authorities thought the case was food poisoning. But just what kind, puzzled them. True enough, it was learned that all the victims had eaten chocolate eclairs, cream puffs or Boston cream pies. However, none of the custard-filled pastries appeared to be "spoiled" although it was suspected that contaminated custard filling might have been the source of the poisoning.

Therefore, the city officials turned over samples of the pastry to the New York office of the U. S. Food and Drug Administration. These Government experts in turn sent the pastry to the Washington laboratories of the Administration.

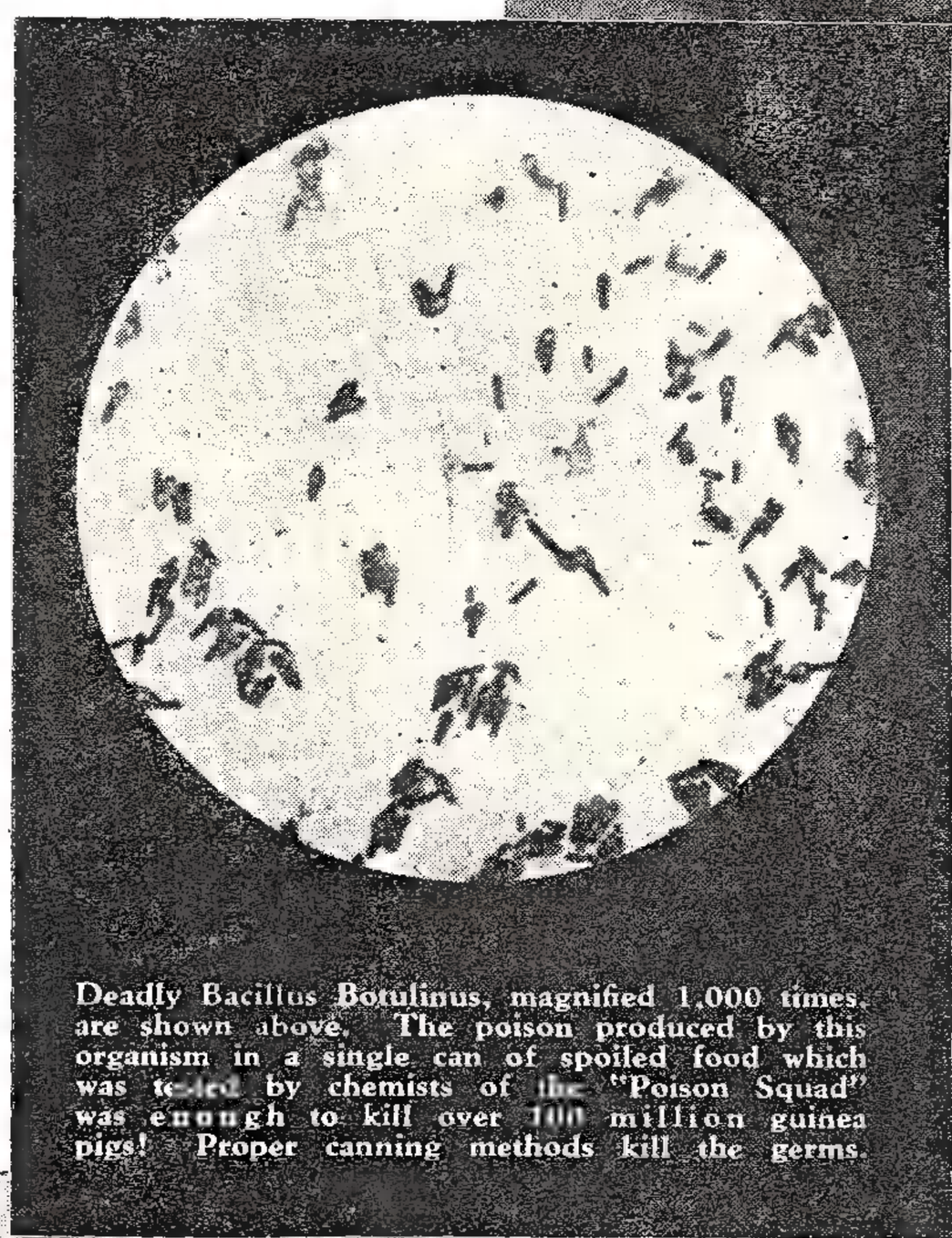
Very quickly, the Federal investigators, aided by local authorities cleared up the situation by tracing the source of the spoiled food to one manu-

Is your ginger ale fit to drink? J. B. Wilson, a Federal expert chemist (center), can tell you. He is shown conducting a test to determine the purity of a soft drink. Right—Spoiled sea foods are sometimes offered for sale, but not if B. A. Linden, bureau bacteriologist, can help it. Samples of sea food are collected regularly and submitted to laboratory examination.

of the POISON SQUAD



"His nose knows." This Federal agent can tell in a few seconds whether or not a shipment of powdered eggs is in satisfactory condition by merely smelling the product. However, to make doubly certain he will take along samples to be scientifically tested in Food and Drug Administration laboratories. All to safeguard your family's health.

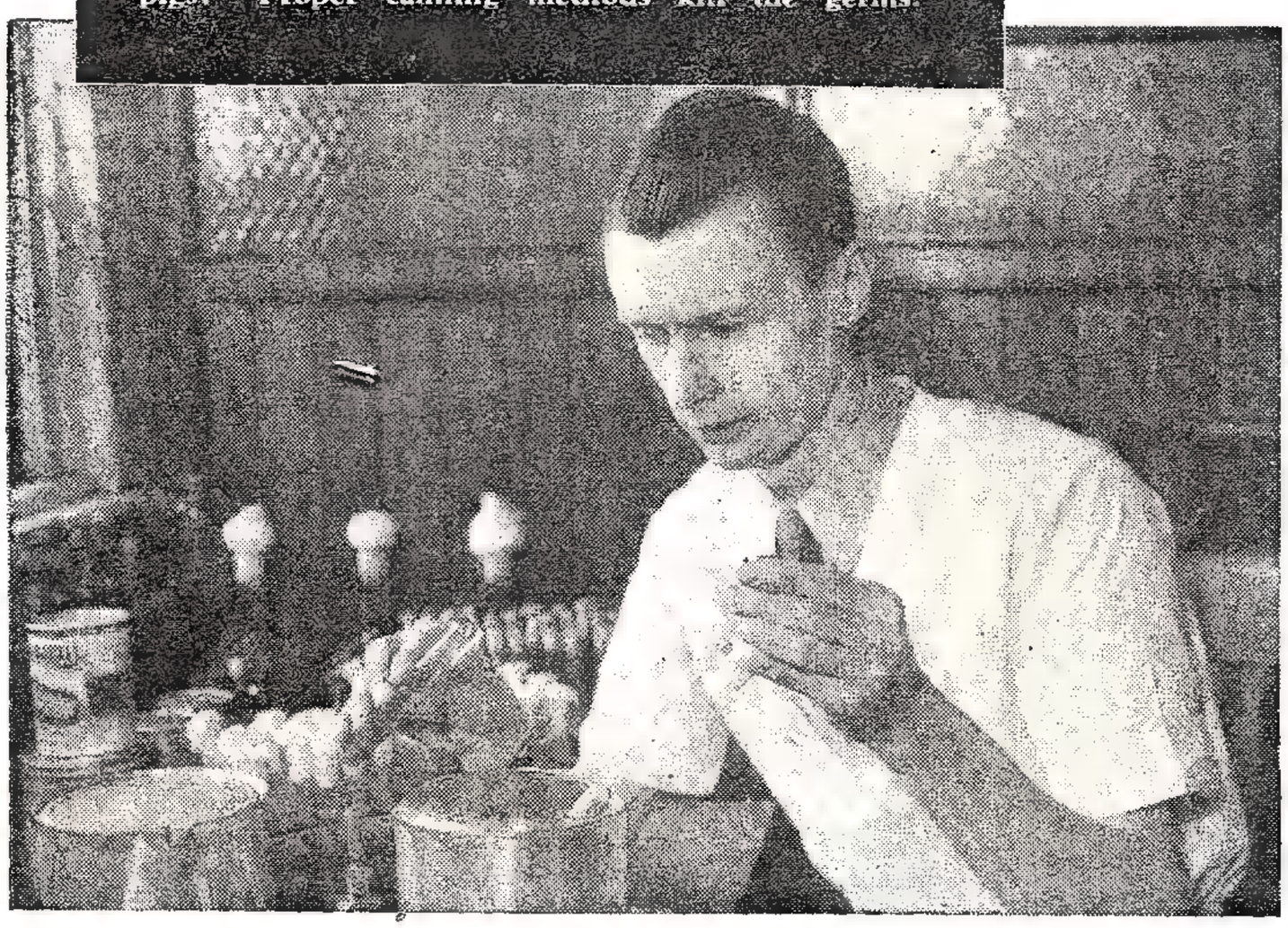


Deadly Bacillus Botulinus, magnified 1,000 times, are shown above. The poison produced by this organism in a single can of spoiled food which was tested by chemists of the "Poison Squad" was enough to kill over 100 million guinea pigs! Proper canning methods kill the germs.

facturing bakery in Westchester County, seizing and destroying all shipments sent out on the same day as the food poisoning outbreak, and identifying the deadly bacteria that caused the large-scale illness.

Thrills are commonplace to these health sleuths, who are known unofficially as Uncle Sam's "Poison Squad." Their job is to guard the safety of your pantry by tracking down, armed with ingenious laboratory and field methods, outstanding cases where moldy fruits and vegetables, contaminated sea foods, spoiled canned goods, and doubtful-looking imported edibles offer a serious menace to the health of the nation.

Just a few of the Poison Squad's recent achievements, besides the settlement of the poisoned pastry case, include: the rounding up, during a three months period, of nearly a quarter million shipping cases of canned salmon, an appreciable percentage of which was spoiled; the investigation of a food poisoning outbreak in Philadelphia somewhat similar to the one at White Plains; and the discovery of the cause of a strange "epidemic" of the



"Looks mighty suspicious," says this laboratory expert as he proceeds with tests to determine whether a can of corn is safe for your palate or whether it is teeming with health-destroying bacteria. Poisoning from canned foods has decreased greatly since adoption of improved canning methods, but the Federal chemists are vigilant.

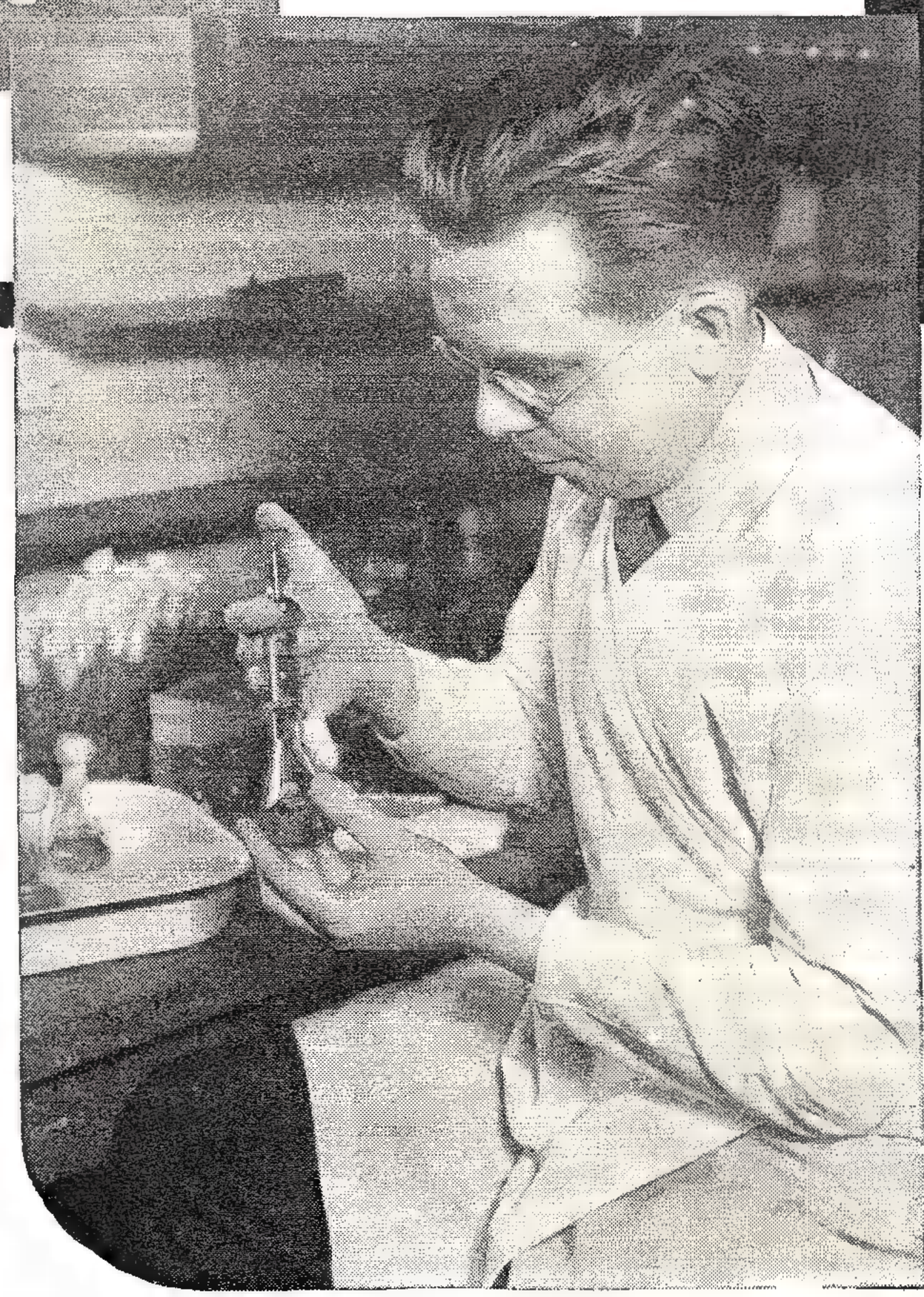
Of all foods fish is usually quickest to spoil, so Federal food inspectors spend a great deal of time in examining fish markets. Ordinary spoilage can be detected by odor or color.

now might be eating apple butter or apple jelly containing lead or arsenic. Recently a jury, after studying a thorough investigation by the Federal food sleuths, found a big fruit company in the state of Washington guilty of a violation of the Food and Drugs Act in shipping interstate stocks of apple scrap which contained residues of poisonous lead and arsenical sprays. About 46,000 pounds of the scrap had been seized by the undercover men assigned to the case.

Surprisingly enough, nearly one-third of the time, money and effort expended by Uncle Sam's food policemen is being devoted to

[*Continued on page* 149]

Dr. A. C. Hunter, chief bacteriologist of the "Poison Squad," is shown (below) preparing a toxin of health-destroying bacteria that sometimes cause outbreaks of food poisoning.



parasitic disease known as trichinosis, at Williamsville, N. Y.

Seizure of poisonous, decomposed or filthy foods is like stopping a murderer's bullet in flight, says Dr. A. C. Hunter, chief bacteriologist of the Poison Squad. Oftentimes such seizure has been criticized as only a worthless gesture that may be compared to the arrest of a murderer's revolver after it has slain its victim. Dr. Hunter does not agree. He says it is better to protect the public health by confiscating dangerous foods before they can cause injury than it is to prosecute after the damage is done. Seizure is the prompt and effective weapon which is the first reliance of the Food and Drug Administration.

Were it not for the vigilance of the Poison Squad your family right

New Navigation Computer Solves Flight Problems

SIMPLIFYING aerial navigation problems to a point never before possible, an entirely new type navigation computer has been perfected by engineers and adopted as standard equipment by many pilots on the nationwide air travel systems.

Designed to provide an immediate answer to navigation questions the pilot must face during the course of a flight, the new instrument combines features of a slide rule with a series of special scales in the form of three celluloid discs which rotate around a common center.

By means of this instrument the pilot may determine immediately the true air speed of the plane, the compass course which he must follow, gasoline consumption and the flying time between terminals. It can also be used to calculate wind direction and velocity while the plane is in flight, allowing the pilot to keep an accurate check of upper air information provided at the beginning of the flight.

New type navigation computer in use during flight. With this instrument the pilot may quickly determine answers to flight problems arising during the course of the trip.

New Slide Rule Aids Printer

Circular slide rule for solving problems involving type, cuts and space to be filled. Device supplies easy and rapid means of obtaining answers to questions arising in the printing art.

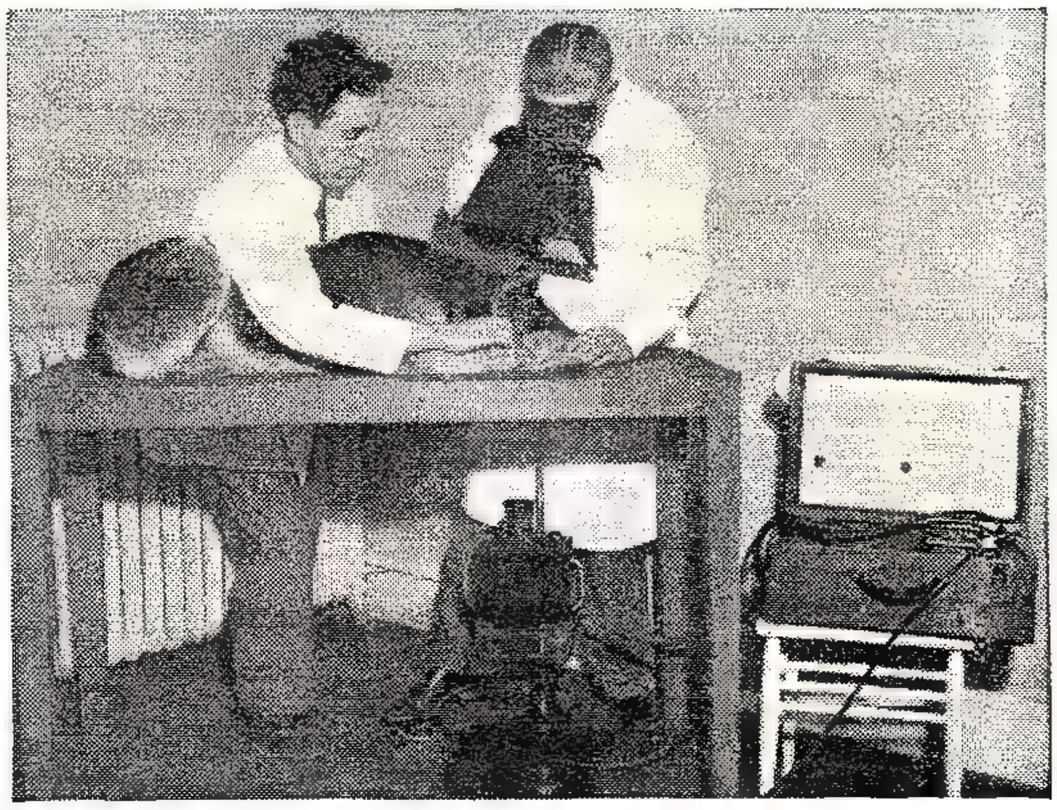
A COPY fitting device determines quickly what size and faces of type will fit a definite copy space. It also tells how much space a certain amount of copy will require in any type face.

Used by many printing concerns, it will also answer the problem of what size cut any photograph or drawing will make.

Fluoroscope Used On Dog

THE value of the flouroscope in animal surgery was demonstrated when a foreign body was removed from under the skull of a German shepherd dog. The success of this delicate operation was credited largely to the use of the fluoroscope.

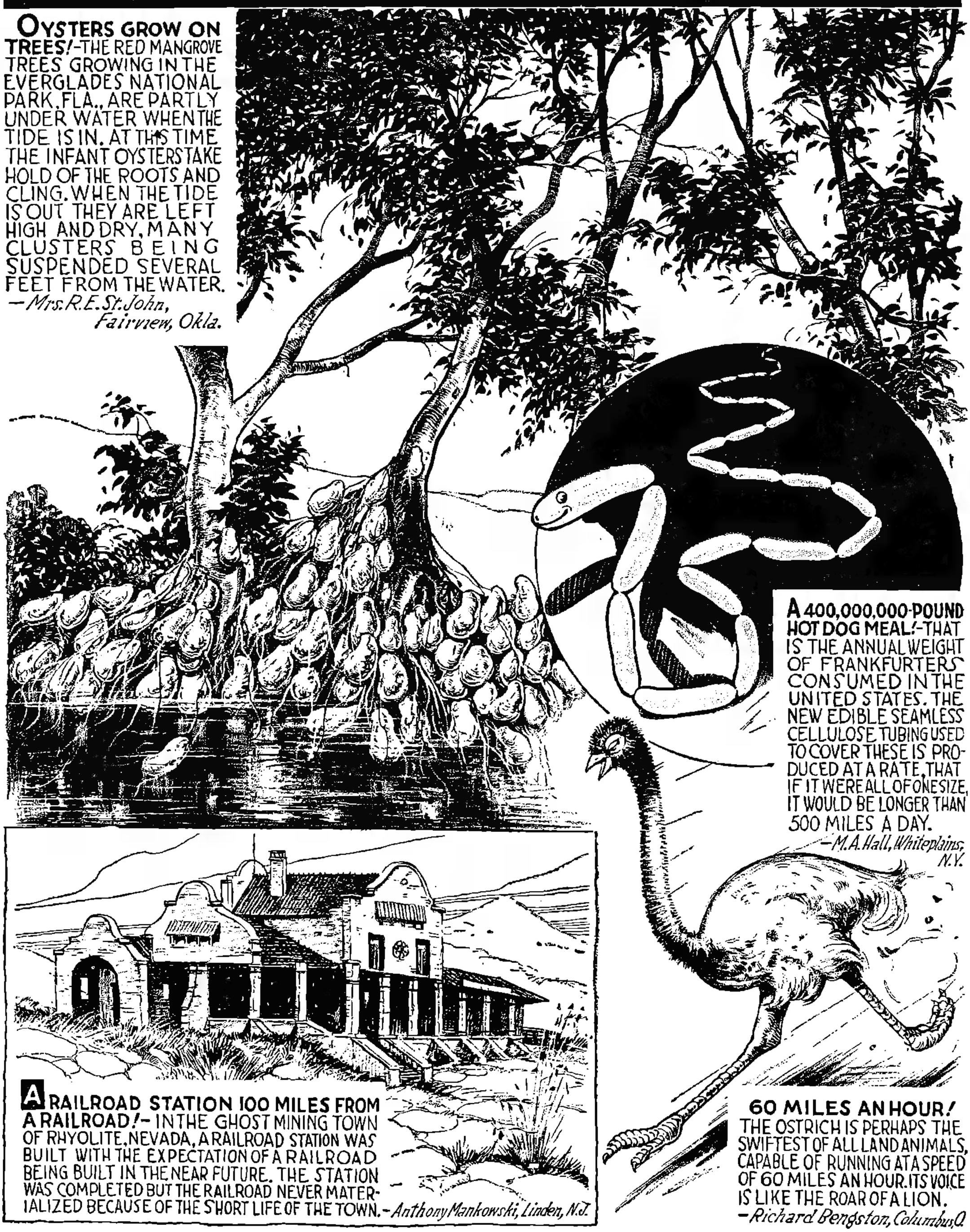
The animal was given a general anesthetic for the operation. A complete recovery was made and now the dog is at home with his mistress. Today the X-ray and fluoroscope has become almost a necessity for veterinary surgery.



A German shepherd dog, Benjie, being fluoroscoped for a skull injury. After determining the extent of the injury, veterinary surgeon removed a foreign body from under the skull.

Oysters Grow on Mangrove Trees

Nic Sprank Offers $5.00 For Best Oddity



OYSTERS GROW ON TREES!—THE RED MANGROVE TREES GROWING IN THE EVERGLADES NATIONAL PARK, FLA., ARE PARTLY UNDER WATER WHEN THE TIDE IS IN. AT THIS TIME THE INFANT OYSTERS TAKE HOLD OF THE ROOTS AND CLING. WHEN THE TIDE IS OUT THEY ARE LEFT HIGH AND DRY, MANY CLUSTERS BEING SUSPENDED SEVERAL FEET FROM THE WATER.
—Mrs. R. E. St. John, Fairview, Okla.

A 400,000,000-POUND HOT DOG MEAL!—THAT IS THE ANNUAL WEIGHT OF FRANKFURTERS CONSUMED IN THE UNITED STATES. THE NEW EDIBLE SEAMLESS CELLULOSE TUBING USED TO COVER THESE IS PRODUCED AT A RATE, THAT IF IT WERE ALL OF ONE SIZE, IT WOULD BE LONGER THAN 500 MILES A DAY.
—M. A. Hall, Whiteplains, N.Y.

A RAILROAD STATION 100 MILES FROM A RAILROAD!—IN THE GHOST MINING TOWN OF RHYOLITE, NEVADA, A RAILROAD STATION WAS BUILT WITH THE EXPECTATION OF A RAILROAD BEING BUILT IN THE NEAR FUTURE. THE STATION WAS COMPLETED BUT THE RAILROAD NEVER MATERIALIZED BECAUSE OF THE SHORT LIFE OF THE TOWN.—*Anthony Mankowski, Linden, N.J.*

60 MILES AN HOUR! THE OSTRICH IS PERHAPS THE SWIFTEST OF ALL LAND ANIMALS, CAPABLE OF RUNNING AT A SPEED OF 60 MILES AN HOUR. ITS VOICE IS LIKE THE ROAR OF A LION.
—Richard Bengston, Columbus, O.

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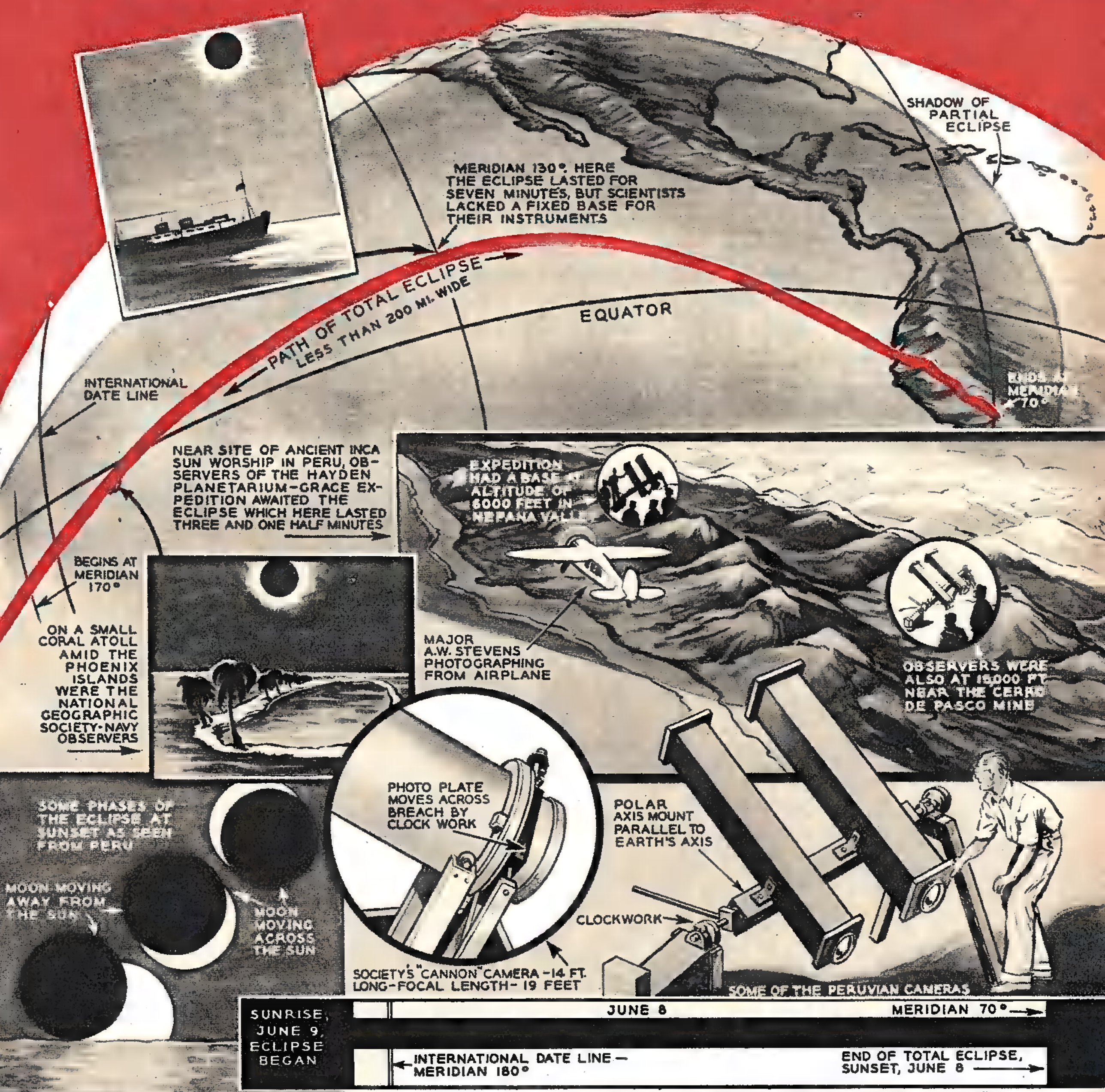
ECLIPSE BEGAN AFTER IT ENDED



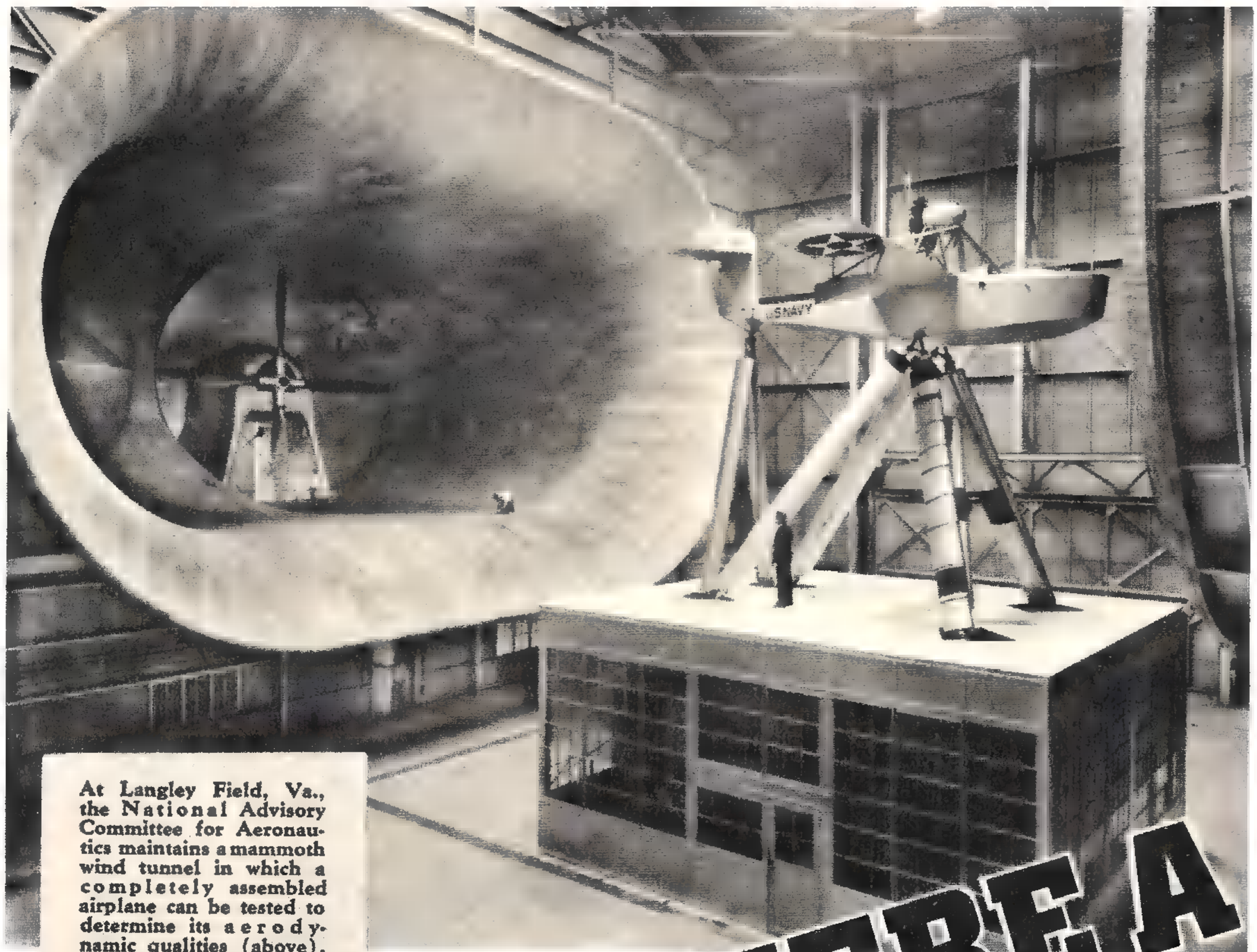
HOW THE ECLIPSE BEGAN THE DAY AFTER IT ENDED

WHEN the shadow of the moon traveled across the earth at 2,000 miles an hour on June 8 and 9, astronomers were given the longest observation time in 1,200 years. But with the fickleness for which it is known, nature provided no firm foundation on which observation equipment could be set.

The total eclipse was visible for more than seven minutes at the 130-degree meridian, but astronomers were unable to set up equipment on a more substantial foundation than the Pacific Ocean or the deck of a boat.

The unusually long eclipse duration was caused by the earth being almost at its greatest distance from the sun while the moon was almost at its shortest distance from the earth.

To take advantage of the longest possible time, astronomers set up equipment on Enderbury Island and on the coast of Peru.



At Langley Field, Va., the National Advisory Committee for Aeronautics maintains a mammoth wind tunnel in which a completely assembled airplane can be tested to determine its aerodynamic qualities (above). Driven by engines producing 4,000 horsepower each, two 35½-foot propellers blast the air past the airplane's controls at velocities up to 118 m.p.h. The tunnel is 434½ feet long, 222 feet wide, 97 feet high.

IS THERE A

by Don Glassman

NOBODY knows how long the present speed marks can endure. In a world of sudden change and far-reaching discoveries, the mortality rate of speed records is high.

All the racing heroes want to hang up unbeatable records. Gradually, but surely, they have been approaching the speed beyond which they cannot go, for there is a law which no speeder can break. Nature laid it down without consulting us.

A 575-mile per hour speed limit for modern airplanes was recently determined at the Langley Field, Va., "super-speed" wind tunnel by the engineers of the National Advisory Committee for Aeronautics. With present designs, you may be sure that no man will surpass that figure.

Beyond the 575-mile critical speed, forward motion is checked by a "shock wave" of

Major James ("Jimmie") Doolittle, famous American speed and stunt pilot, conducted risky flight tests that helped determine the acceleration speeds of various aerial maneuvers.

SPEED LIMIT?

In the Macchi-Castoldi-72 seaplane shown above, Lieut. Francesco Agello, Italian ace, set a world's speed record of 440.67 m.p.h. in 1934. The plane's 3,000 h.p. Fiat engine had tandem propellers revolving in opposite directions to eliminate torque.

A too-sudden change in acceleration while testing a new Navy plane is believed to have caused Jimmy Collins, well known test pilot, to become unconscious, resulting in the crash that caused his death.

turbulent air that travels from front to rear of an airplane wing and wastes the energy. Result:—the wings lose their lifting power.

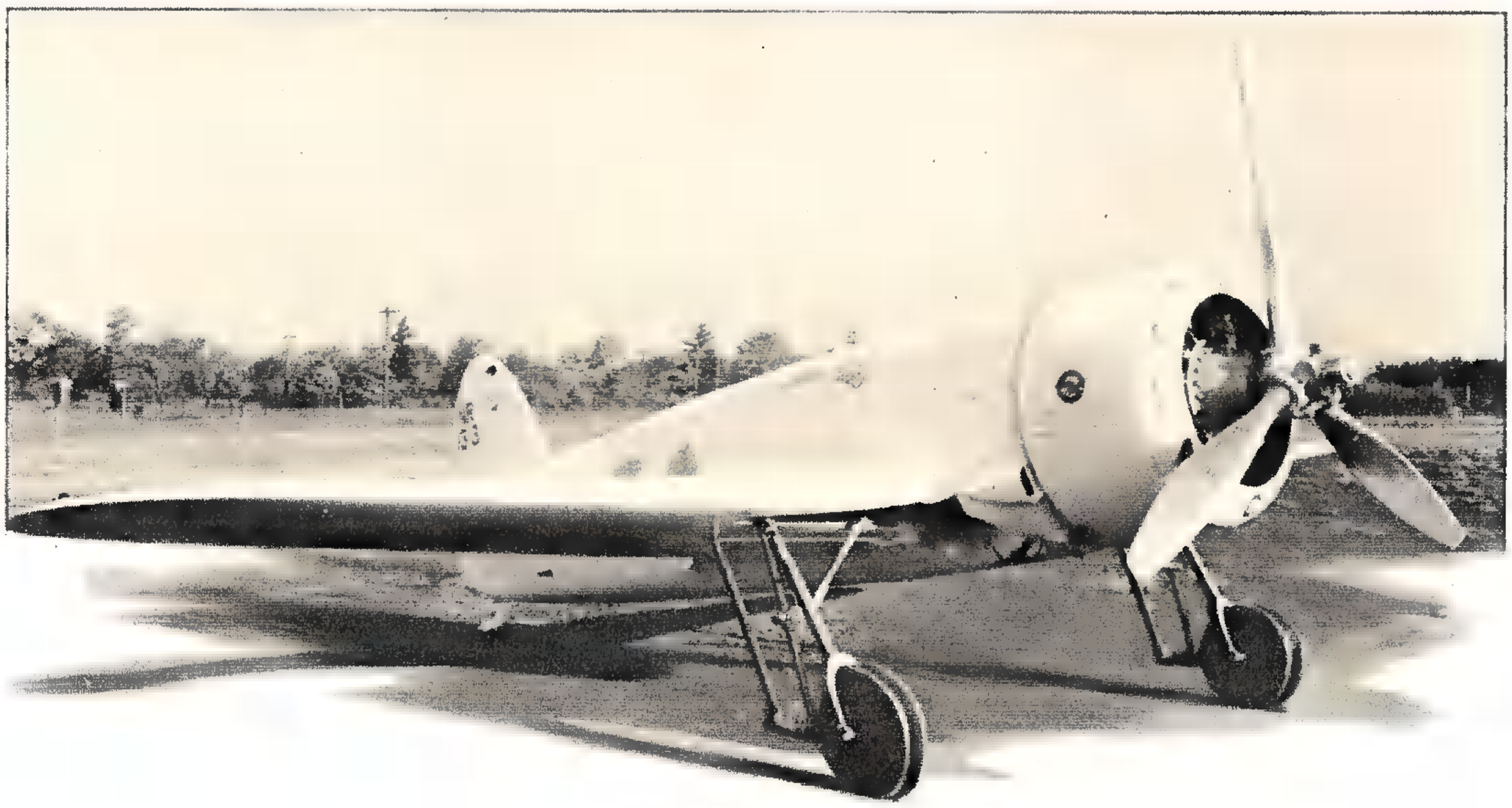
In engineering language this "shock wave" of air is called the "compressibility burble." The violence and turbulence of the burble causes a severe drag on the wings. The power that was intended to support the wings is spent as useless heat.

The burble is not a factor in airplane speed until the free stream of air approaches the velocity of sound—750 miles per hour. With each increase in speed, the burble travels farther from front to rear of the wing, and dissipates still more energy as heat. If we could travel beyond 750 miles per hour sound waves could never catch up with our flight. That would be "supersonic" speed.

These facts hold good for the types of airplane wings in use today, and it is highly probable that a corresponding burble could be found for every common form of transport if desired.

With suitable wind tunnels, one could determine the critical speeds of ship, train, auto, and dirigible forms, but at the present stage of development there is no point in making such experiments, since all these transports are still very far below their respective critical speeds. With the airplane, however, the speed record now held by Italy stands at 440.67 miles per hour, only 135 miles per hour below the critical speed.

The Speed School at Densenzano, Italy, has specialized in the training of crack speed pilots for years. Premier Mussolini told these men to work for a velocity of 600 miles per hour. In the light of present knowledge about



Designed, built and flown by Comdr. Frank Hawks, noted speed pilot, the airplane shown above lived up to its name—*Time Flies*—by attaining speeds exceeding 300 m.p.h. before it was wrecked in landing. The craft featured an air-cooled engine of 1,150 horsepower.

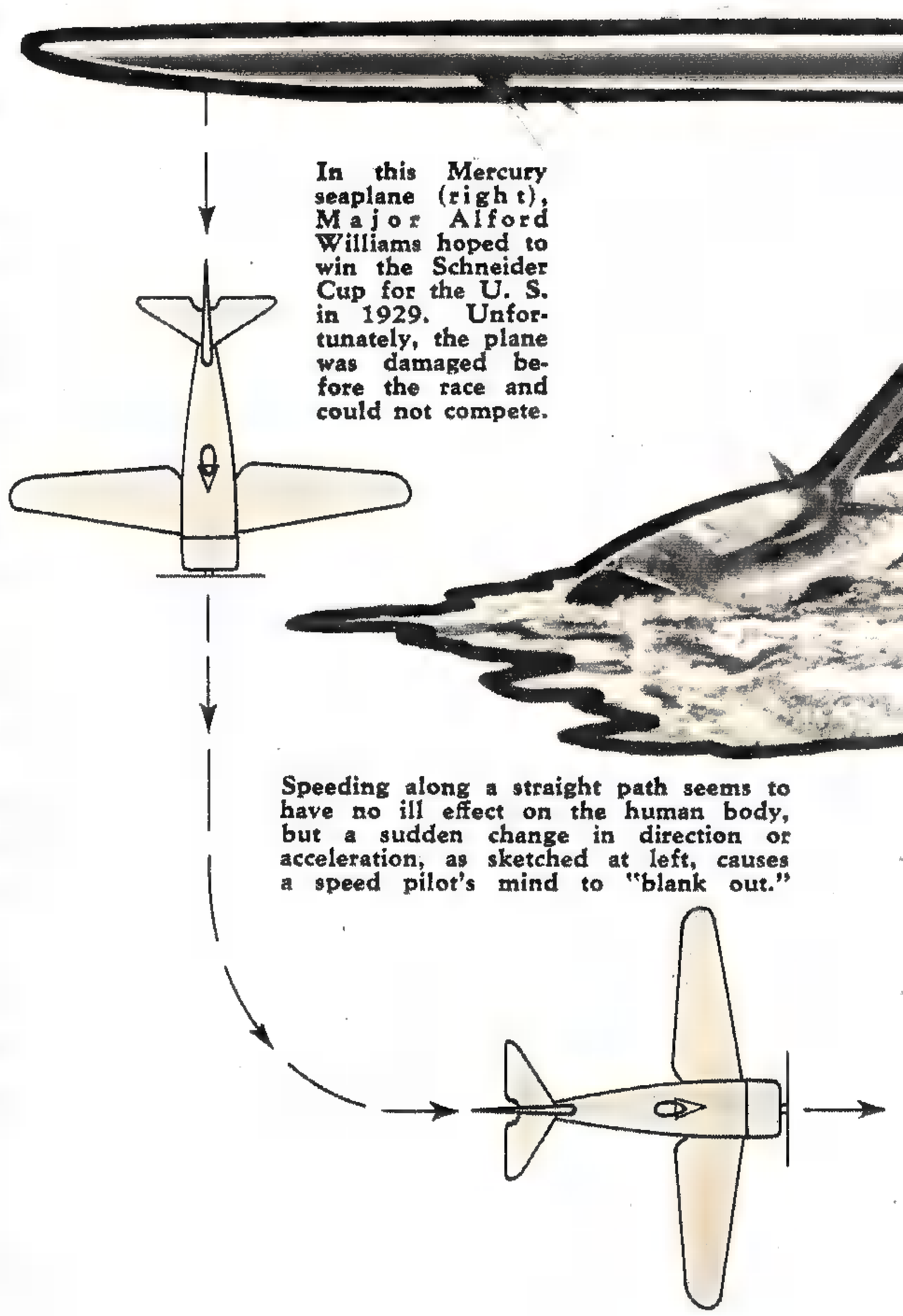
the burble, the Italians seek to invent a new type of air foil with a higher critical speed. And that is not impossible.

What about man's own engine? Do our bodies have a critical speed? As I sit on my chair, I am being whirled through space at the dizzy velocity of 1,140 miles per minute—the earth's speed. It is said that 36 distinct motions are involved. Nobody feels any ill effects from this pace, although it is far beyond the critical speed of the airplane.

There is quite some difference, however, between traveling through space with Mother Earth and traveling at 400 miles per hour in an airplane. In our joy ride on the earth we do not turn sharp corners or experience sudden accelerations. Traveling along a straight line at any speed seems to make little difference to our bodies. But the experience of speed pilots tends to show that taking curves at high speeds is something positively annoying, and probably injurious, if carried to extremes.

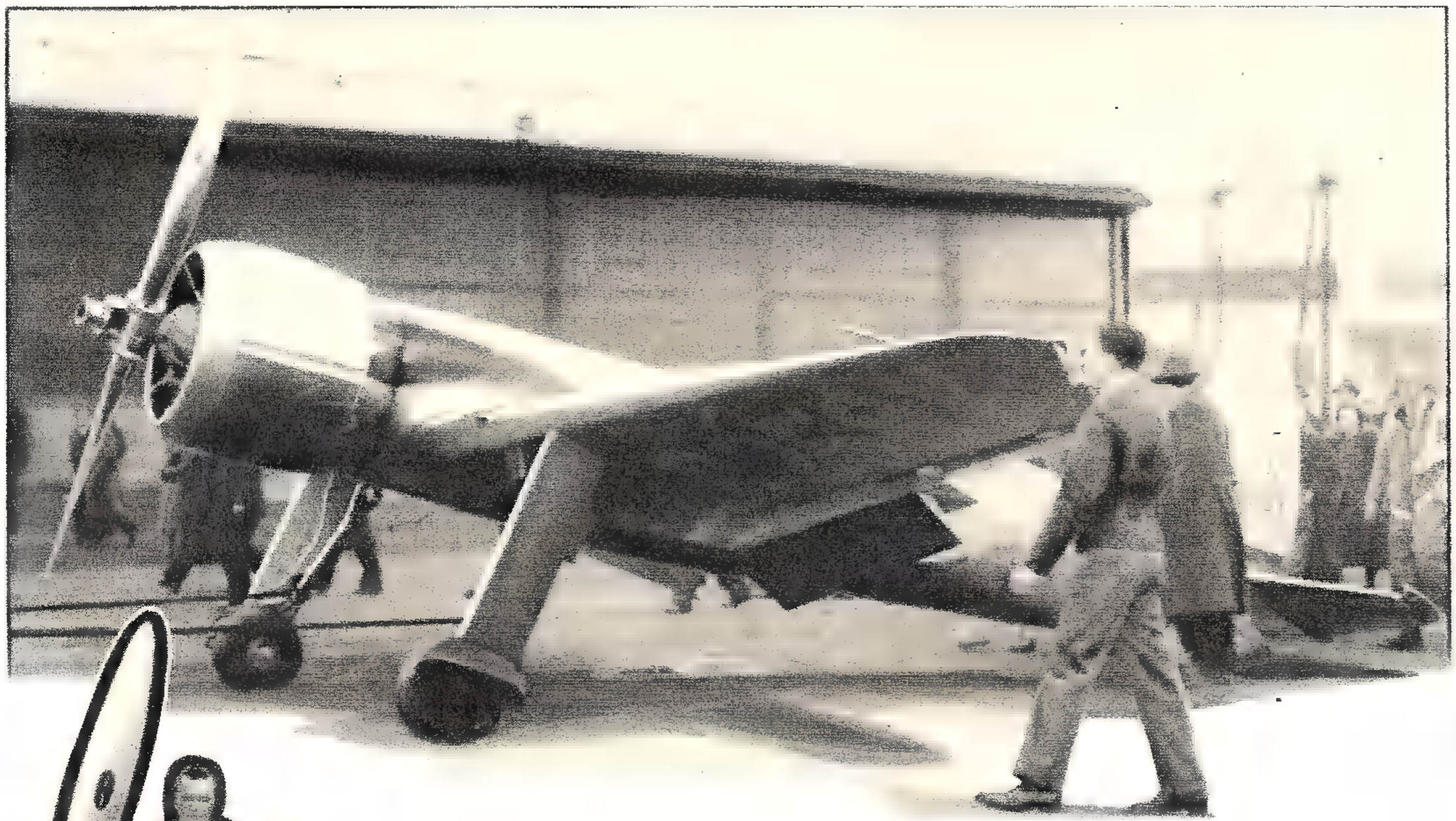
The "blank out" experienced by speed and test pilots is a sensation caused by the blood rushing away from the head, creating a shortage of oxygen. In highspeed aerobatics, the centrifugal force makes one's body feel much heavier than it actually is, and one finds it difficult to raise an arm or to stand up. To counteract this sudden drain of blood from the head, test pilots wrap their bodies in bandages, or tight belts.

Sudden acceleration and quick change in direction are the chief difficulties man has to contend with when attempting to set new

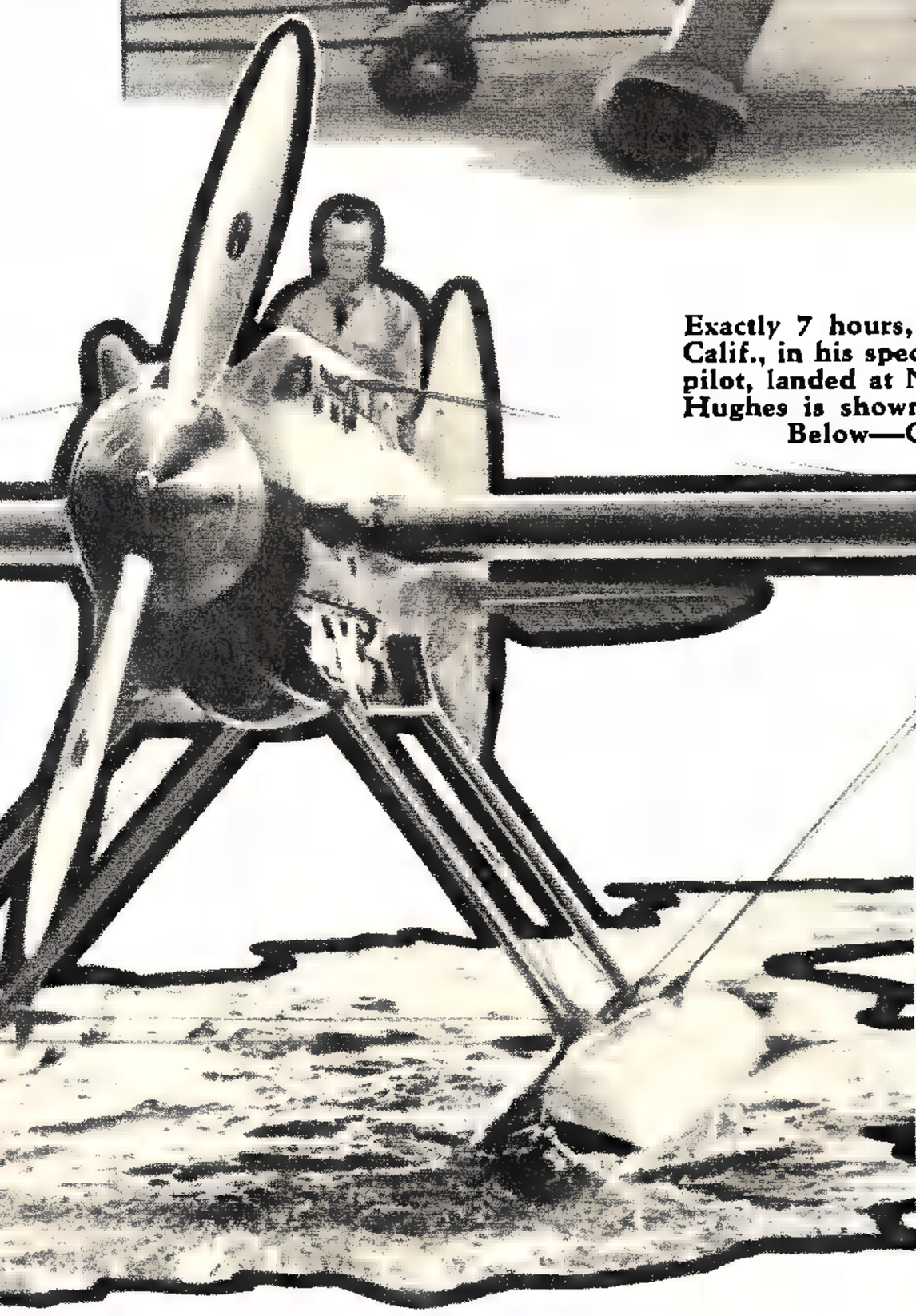


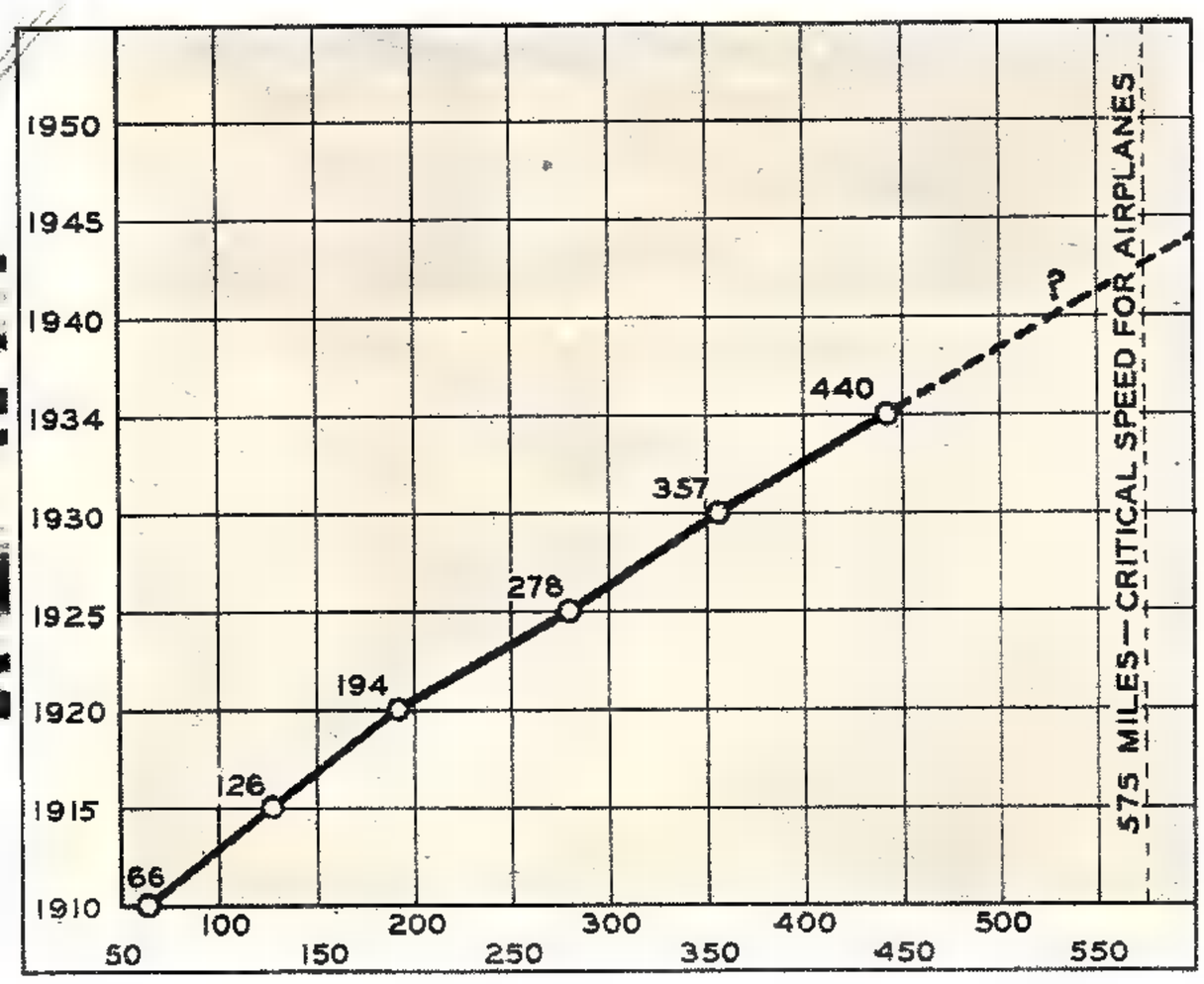
In this Mercury seaplane (right), Major Alford Williams hoped to win the Schneider Cup for the U. S. in 1929. Unfortunately, the plane was damaged before the race and could not compete.

Speeding along a straight path seems to have no ill effect on the human body, but a sudden change in direction or acceleration, as sketched at left, causes a speed pilot's mind to "blank out."



Exactly 7 hours, 28 minutes and 27 seconds after he zoomed aloft at Los Angeles, Calif., in his specially built speed plane (above), Howard Hughes, wealthy sportsman pilot, landed at Newark, N. J., having averaged 332 m.p.h. for the 2,490-mile flight. Hughes is shown walking at the tail of his plane as it was wheeled into a hangar. Below—Chart showing the steady climb in speed records since 1910.





speed records. To visualize what happens in a case of extreme acceleration: if an airplane could take off with the acceleration of an automobile piston, the pilot's effective weight would become 20 tons and his body would flatten like a pancake. A burst of speed can break a man's neck unless he has a solid head rest.

A free body falling in space falls 16 feet in the first second of its descent and gathers speed at a rate of 32 feet per second. This rate of fall is called one-gravity. If the acceleration is increased to about three times the normal acceleration of gravity, you approximate the takeoff speed of an airplane launched from a catapult. An acceleration of three-gravity is 100 times the normal acceleration of a steam locomotive. An automobile starts off only one-sixth as fast as the catapulted airplane.

Some interesting discoveries in the field of

[*Continued on page* 122]

folding house becomes trailer

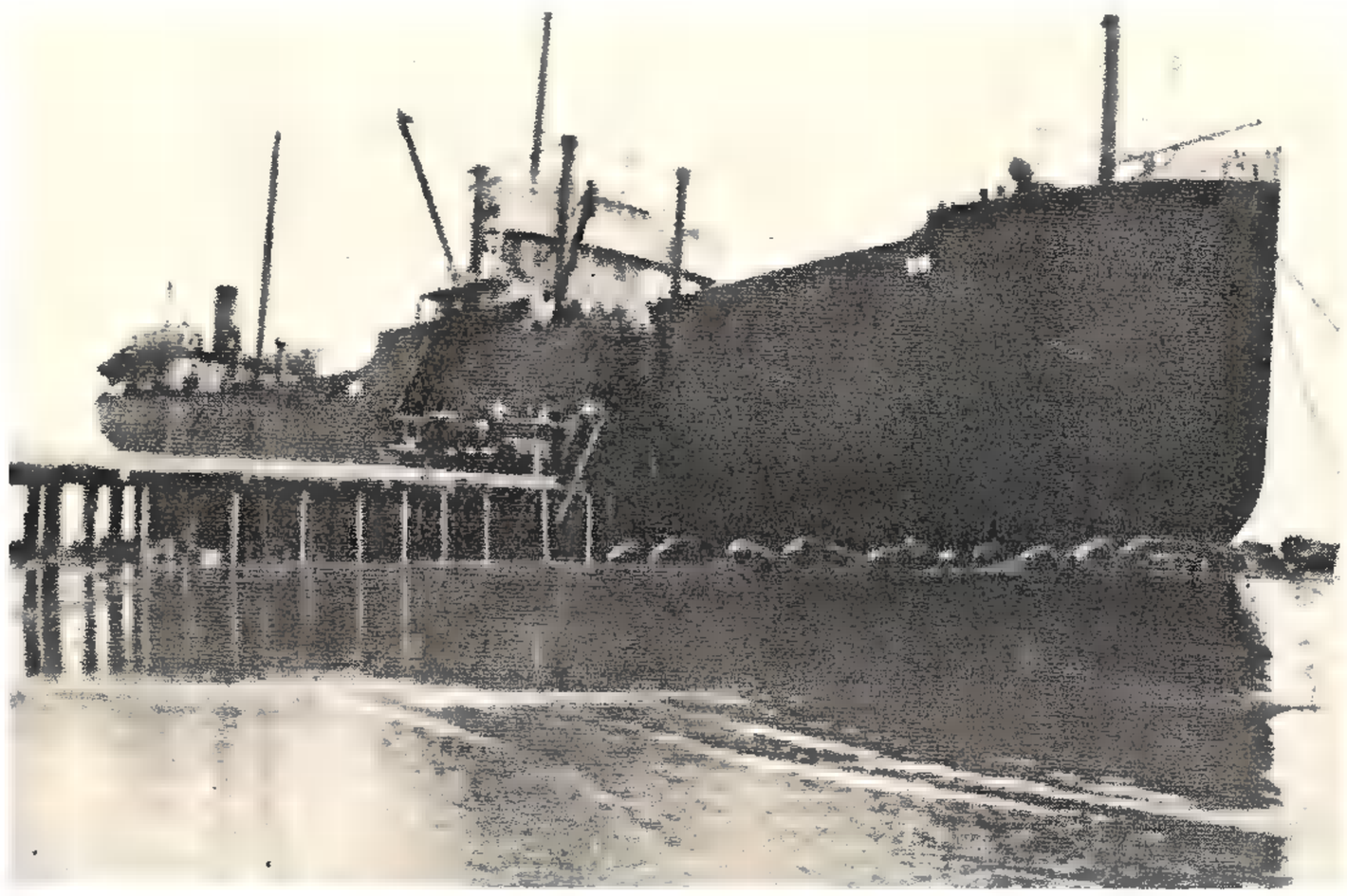
Above—A new three-room house capable of rapid conversion into a conventional type trailer. William B. Stout, inventor and designer of the convertible trailer, is shown seated in one of the three rooms. When sides and bottom are folded up, house more nearly resembles conventional trailer. When folding sides are placed in position, this home on wheels gives more room than usually is available. Floors are raised above ground, thereby increasing comfort of the inhabitants.

Above—Folding the folding trailer. Side pieces fold down to floor and top comes down and covers both pieces as all three fold against sides of permanent structure. Ease of folding makes arrangement convenient for getting under way when ready. At right is shown the trailer ready to proceed on its journey. The two extra rooms have been folded up for traveling and trailer appears to be the conventional type. When it arrives at new location, a few minutes work will produce the two additional rooms.

Trucks Remove Cargo From Wrecked Freighter

THE Mexican freight steamer "Sinaloa," strike-bound, with no crew to man her engines, was blown ashore at Terminal Island, Calif., in a heavy gale. Because her bottom plates were so badly damaged by the beating taken on the jagged rocks, salvagers decided that the cost of repairs and refloating her would be more than she was worth.

To remove the cargo, piles were driven and a trestle constructed out over the beach to her side. A large hole was cut in the hull and with the help of stationary engines rigged on the trestle, the cargo was loaded on trucks and hauled ashore.



Mexican freight steamer on rocks of Terminal Island, Calif. Trucks travel to craft by trestle, where cargo is loaded through hole cut in hull. Danger to workmen brought high wages.

Flash Bulb Has Wire Element

Uniform flashing qualities are obtained by exactly measured wire length and diameter. "Safety spot" denotes presence of air in bulb.

A HYDRO-LANIUM wire flash bulb recently brought out is reported to give 50 per cent more illumination than the foil type.

An exactly measured wire diameter predetermines the timing characteristics of the flash, and the measured length of the wire predetermines the light intensity.

Because of the measured light control, it is possible to lengthen the peak intensity so that the flash is longest at its brightest point, thus throwing more light on the photographic plate when the shutter is open.

The light peak of this bulb occurs within 26 to 28 milliseconds after current is turned on.

New Saw Operates By Lever

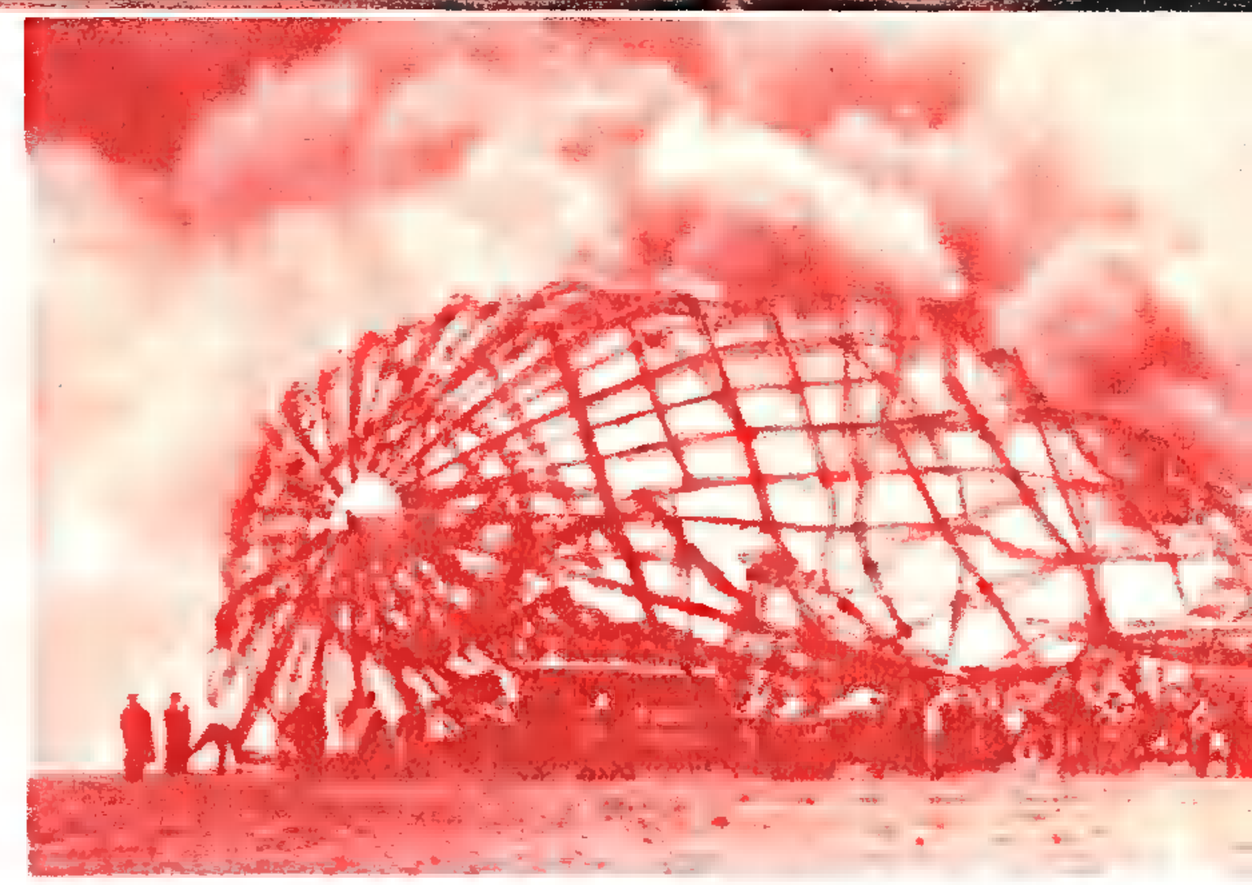
A NEW type saw, capable of cutting a tree close to the ground while being operated from a standing position, recently has appeared on the market in Germany. Operating the handle with a side-to-side motion causes the saw to move in a corresponding direction.

Lever-operated saw cuts close to the ground and is operated by workman in standing position. Gears transfer power from lever to semi-circular saw blade. Spring maintains blade pressure.

36 Killed on the "Hindenburg"

Going!

The nose already a mass of burning wreckage, the flaming tail of the giant German Zeppelin *Hindenburg* settles to earth after exploding while landing at Lakehurst, N. J. Naval air base on May 6th, 1937.



TO MOST of us Earth-bound mortals, there is something singularly terrifying about death from the sky. The only terror equal to it is death from fire. When the two horrors are combined in one spectacular disaster such as overtook the airship *Hindenburg,* we of panicky imaginations are prone to ignore facts, prone to throw up our hands and cry, "That is enough!"

Yet the men who must face this fate again if airship progress is to continue are far from ready to cry enough. Every uninjured survivor of the *Hindenburg* crew hurried back to Germany, that he might get a berth in the next great Zeppelin, the *LZ-130,* rapidly nearing completion.

And this attitude is not mere heroics. Airship men really believe that the rigid dirigible is a reliable means of transportation. Disasters? Of course they encounter disasters. "What mode of transportation does not?" is their argument. And they make a pretty good case for the airship, too.

They will tell you, for instance, that dirigibles have carried more than 250,000 paying passengers, yet up until the time 12 of the 36 passengers on the *Hindenburg's* last

But Records Prove That

ZEPPELINS ARE SAFE!

by
Bob Gordon

trip were killed at Lakehurst, not a single passenger of any airship had ever lost his life.

You don't believe this? Well, here are the figures. On the three commercial Zeppelins built and flown before the World War, 37,250 passengers were carried without even a serious injury. Immediately following the war, the *Nordstern* and the *Bodensee* carried several thousand passengers before being seized by the Allies. Goodyear blimps have carried 180,000 passengers in perfect safety, while the *Graf Zeppelin* and the *Hindenburg* carried 16,000 on regularly scheduled runs.

As to crew casualities, aside from one blimp pilot and two members of a ground crew killed when their ship was wrecked in a violent gale, after being torn from its moorings, no crew member of a commercial ship had been killed before the *Hindenburg* carried 24 of its 66 members to a fiery death.

There have been only 156 large rigid dirigibles built in the history of the industry. Twenty-nine of these were built and flown in Germany before the war. Several of the first ones were wrecked, but no one was killed. Count Zeppelin, a balloon observer for the Union Army in the American Civil War, devoted practically his entire lifetime to building and flying

Clouds of smoke still rise from the twisted steel frame (above) of the ill-fated airship as rescue workers arrive to search for possible survivors. The *Hindenburg* had just completed her 21st crossing from Germany to the U. S. when the tragedy that caused the world to gasp in horror occurred. Right—Aerial view of the airship's charred remains at Lakehurst base.

dirigibles, and died a natural death at the age of 76.

During the war, Germany built 104 and England 14 large airships. Sixteen German Army ships were lost in action, including four that were sabotaged while in their hangars; two bombed by British planes while on the ground, one blown to sea in a gale, and five stranded—two in enemy territory, three in Germany. Only four were shot down in flames. The rest were dismantled because they were obsolete, had been badly damaged (although able to return home), or to prevent confiscation by the Allies at the close of the war.

Since the war, Germany has built four large rigid airships, the United States three, and England two. No other country has ever built this type of craft.

Of Germany's four, the *Los Angeles* was retired after many years of safe use. The *Graf Zeppelin* is still in regular service, having made more than 500 flights without accidents. The *Dixmude* disappeared over the Mediterranean after being turned over to an inexperienced French crew. The *Hindenburg* was destroyed while landing at Lakehurst, when exhaust flames from the motors or static electricity probably ignited hydrogen gas as it was being valved.

Of the two English ships, one broke in mid-air, due to structural weakness and burned. The other was driven into a hillside during a rainstorm.

Of the three American-built ships, the *Shenandoah* broke in two during a thunderstorm. The *Akron* was flown into the sea at full speed during a thunderstorm, while still intact. The frame of the *Macon* broke during a storm at a spot where needed repairs had been deferred, and was landed at sea at a spot selected by the Commander, with the loss of only two lives.

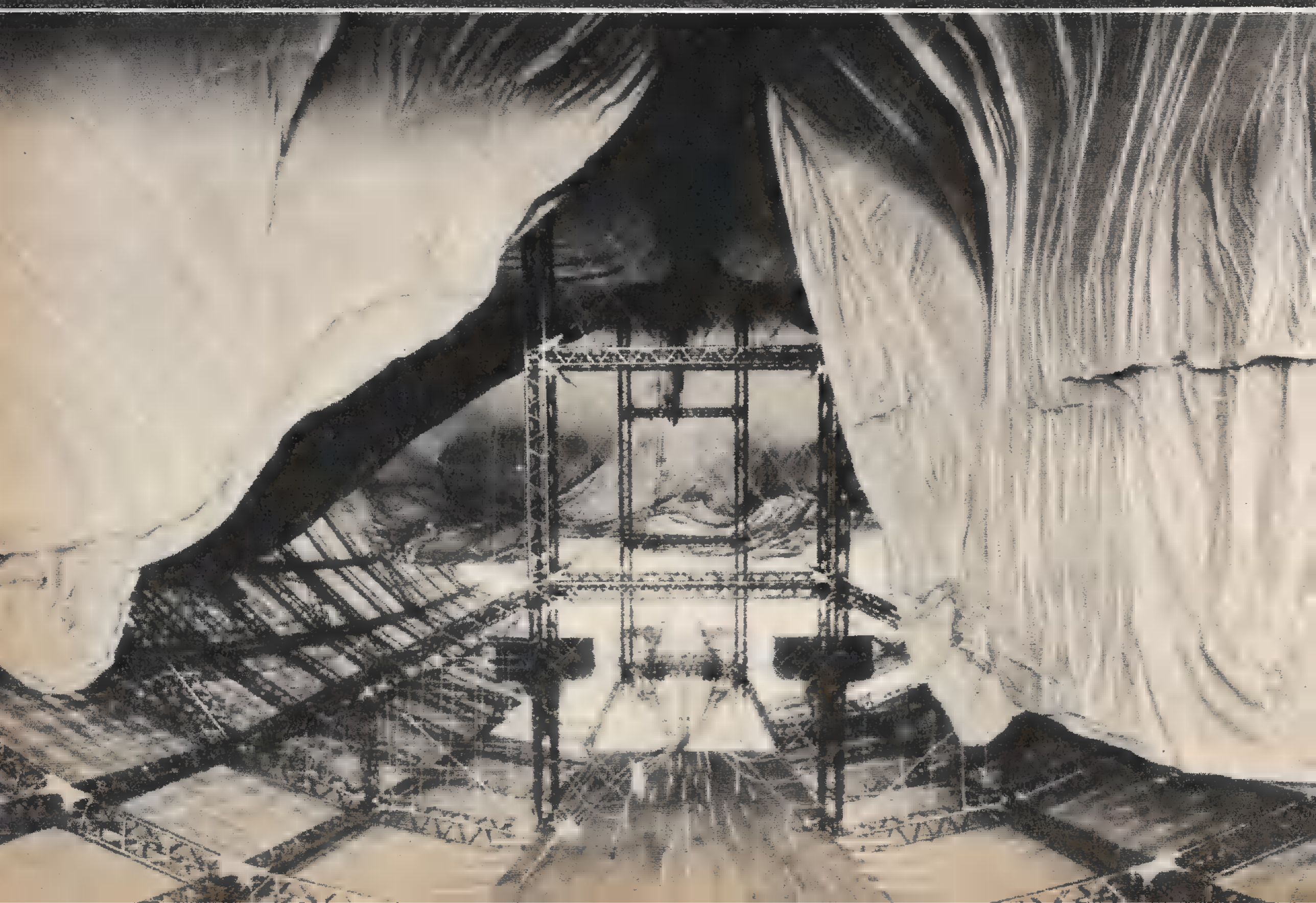
In the entire world, since the first dirigible was flown, only 318 lives have been lost in peace time operations of lighter-than-air craft.

Then why all the cry that the dirigible is doomed?

Since the World War there have been 69 major submarine accidents, in which 771 men were lost. We still build submarines.

During the same period there have been more than 100 "notable" marine disasters, in which 12,000 lives were lost. Yet try to book a quick passage on even a lowly freighter!

A view of the interior of the former giant airship is shown below. A series of 16 gas cells like those shown here held [illegible] million cubic feet of inflammable hydrogen.



You will find the accommodations booked for weeks, sometimes months, ahead.

There have been 100,000 railroad fatalities since the war, yet the railroads advertise (and truthfully) they have the safest means of transportation.

On almost any summer holiday in the United States, more lives are lost in auto accidents than have been lost in the whole history of the airship. More than half a million persons have thus been killed since the war.

There is no cry to stop commercial airplane flights, though the past season has been disastrous. And if you think the air lines have lost business on account of these accidents, take the fingers of one hand out to Newark airport, and count the empty seats.

Dr. Hugo Eckener, rated as ranking authority on airships.

Then why this condemnation of the airship, when, as a means of commercial transportation, it is the least offender of all? Are twelve passenger deaths, out of a quarter of a million passengers carried, too great a price to pay for the development of this swift and comfortable means of long distance transportation?

The fate of the rigid airship now seems to be entirely in the hands of the Zeppelin Company, and the U. S. Navy. The Germans have no idea of abandoning the industry, which for the first time was getting on a paying basis when the *Hindenburg* burned.

Four engine gondolas of a type shown above, each housing a 1200-horsepower Diesel engine, were features of the *Hindenburg's* massive frame construction.

The *LZ-130*, now nearing completion, will have accommodations for 100 passengers; the projected 131 will carry 150. Since an average of forty passengers have been turned away from each trip of the *Graf Zeppelin* and the *Hindenburg*, the company has no qualms about being able to sell the additional accommodations.

It costs an average of $53,000 a round trip for an airship to make the North Atlantic flight. On the other side of the ledger will be $79,000 passenger revenue, and an additional $18,000 from mail and freight, making a net profit of $44,000 for each round trip. Not a bad payoff on a $2,000,000 investment!

But the pie the Zeppelin Company really has its eye on is a trans-Pacific service. It is a ten-day trip from Seattle to Japan by the fastest steamers. The *Graf Zeppelin*

The *Graf Zeppelin,* still in active service after having made more than 500 flights without an accident, is shown making a landing at Friedrichshafen, Germany, the birthplace of all German airships. Despite the set-back of the *Hindenburg* disaster, German authorities state that they will continue to build airships, the *LZ-130* and *131* being constructed at this time.

made the trip in less than three days, nine years ago.

Airship officials do not consider the present Clipper planes as serious competition. The present planes carry only six passengers, a crew of nine, and half a ton of mail and cargo.

Opposed to them, the *LZ-130* will carry 100 passengers, a crew of sixty, and twenty to thirty tons of mail and freight. The Clipper ships, though they fly faster, take the longer southern route, make four stops en route, and take from five to six days. An airship can take the great circle route, and fly non-stop in less than three days.

Aside from larger passenger quarters, and a slightly larger gas capacity, there will be no radical change in the design of the *LZ-130* and 131, which will be almost sister ships of the *Hindenburg.* They will, of course, be buoyed by helium, in spite of its greater cost when compared to the highly inflammable hydrogen. That is one lesson the Germans have learned. Perhaps from necessity, for this government will never again permit a hydrogen-filled ship to use its landing facilities, according to reports.

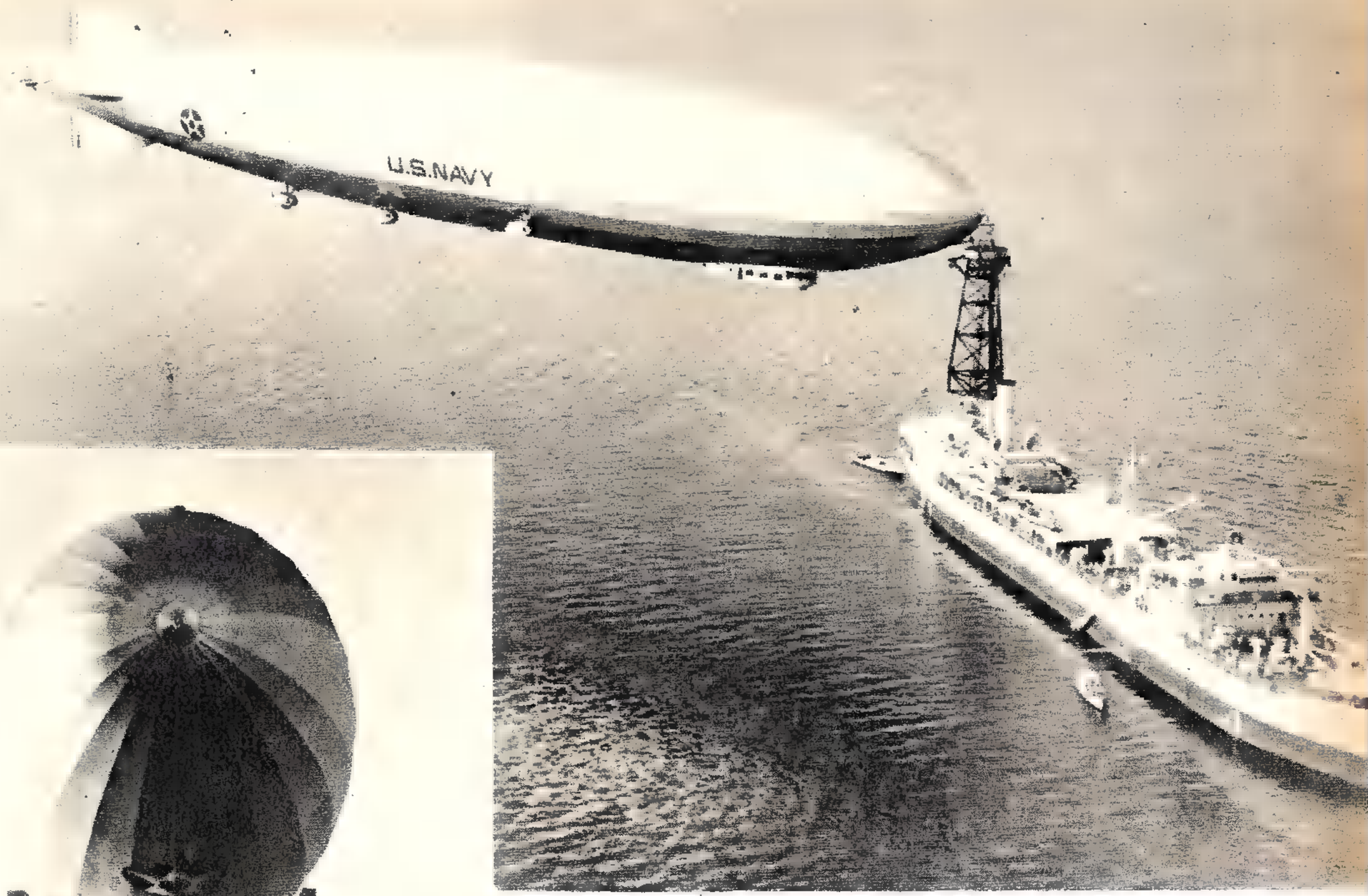
Though several newspaper commentators have inferred that the United States was to blame for the *Hindenburg's* burning, through refusal to sell helium, this is not true.

The Navy did insist upon a monopoly of the gas at first, when it was scarce, and extremely expensive to extract from natural gas. But when an ample supply was assured several years ago, the sale to foreign countries for commercial purposes was offered. The German government could have secured helium for both the *Graf Zeppelin* and the *Hindenburg,* but balked at the price. It was Dr. Eckner's insistence on obtaining helium for the *Hindenburg* that caused his break with the Nazi Government, and his subsequent dismissal from command of that ship, according to well-informed people in the industry.

Commercial development of the rigid airship in the United States seems to be dead at the present time, due largely to a lack of interest in those having sufficient capital for the venture.

The Science Advisory Board, appointed to investigate the future possibilities of the dirigible shortly after the *Macon* crashed, recommended that another ship be built. It designated that this ship be used "at least for a time, as a flying laboratory and training ship." The airship was never built.

As to the military use of the dirigible, it is the general opinion in Army circles that the airplane and blimp can accomplish military missions more effectively, and more economically, than can large airships. With airplanes able to climb higher than the dirigible, and able to fly circles around it, the airship has lost its value as a wartime scout and raider over land. The day of



The military value of airships was demonstrated by the *Los Angeles* (above). An airship can scout 172,000 square sea miles in the time a cruiser scouts only 4,800.

Retired after years of safe usage, the dirigible *Los Angeles* is shown making a landing on an aircraft carrier during Naval tests.

the airship bomber has definitely passed.

But with the Navy it is something else again. Nothing can take the place of the large airship as a long-range scout. With a liquid desert as vast as the Pacific to patrol, twelve airships, costing less than one cruiser, could absolutely prevent a hostile fleet from approaching our shores undetected, while all the ships and airplanes in the fleet could not guarantee this. Besides, the dispersion of the fleet for scouting purposes, or to protect coastal cities, would so weaken it that a hostile fleet, able to approach intact, could defeat our forces piecemeal.

During twelve hours of daylight, a cruiser costing $18,000,000, with a crew of 605, can scout 4,800 square miles of sea. During the same period an airship manned by a crew of sixty, and costing only $2,000,000, can scout 172,000 square miles.

But cannot airplanes, with even greater speed, patrol even a greater territory? For a short distance off shore they can. But even the longest-range airplane cannot remain aloft more than 72 hours (you can't refuel far at sea), while an airship can remain aloft two weeks, drifting at night to save fuel.

The argument usually given against the airship is that it is so vulnerable that, if it should discover the approach of a hostile fleet, it would be destroyed. Granting this for the moment, the same also applies to any other patrol medium. A cruiser must approach to within ten or twelve miles to secure the desired information, so could not hope to escape unscathed. It would be more economical, both in lives and money, to risk an airship to secure this vital information. The airship would certainly have time to radio its discovery before being destroyed; and the sacrifice would be well worth while if it prevented one ship from being sunk, one city from being bombarded.

But the dirigible would have better than

[*Continued on page* 120]

Tiny News Plant Draws Crowds

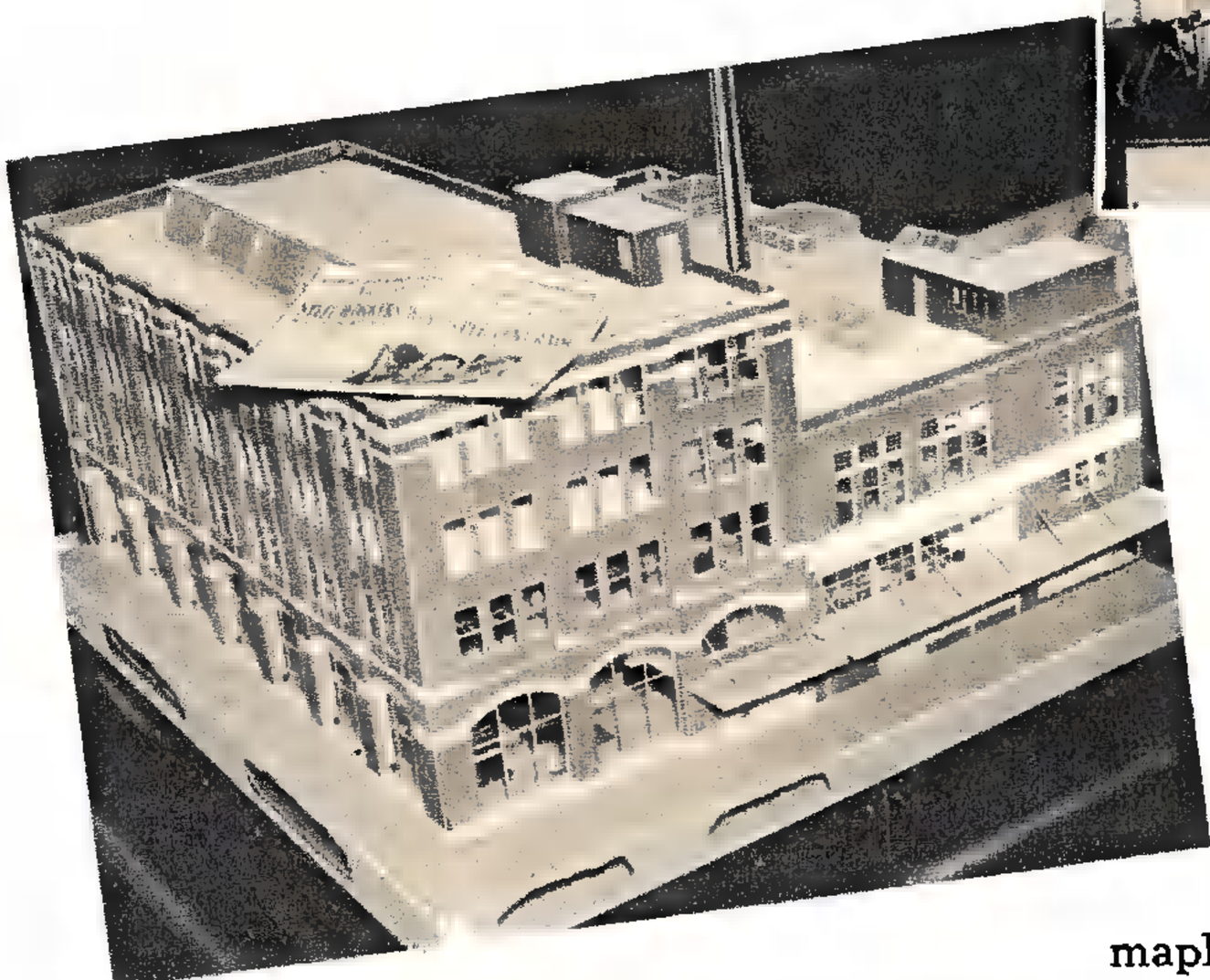
More than a thousand parts—gears, cams, levers, etc., are reproduced in this scale model of the printing presses of the *Buffalo* (N. Y.) *News*. Compare size with folded newspaper.

Charles Beenau (right) and Franklin Meno, co-builders of the model plant.

A battery of 34 model linotype machines, each with over 100 parts, is a feature of the miniature plant. Compare size of machines with ruler at top of photo.

AMAZING in its accuracy, precision, and fidelity to its prototype, a scale model of the mechanical section of the Buffalo (N. Y.) *Evening News* building attracted scores of the newspaper's readers when placed on exhibition. Constructed by two of the newspaper's employees, the miniature building is only three feet high and five feet square, yet every detail, not only of the building exterior, but presses and linotypes, including their gears, cams, levers, etc., were reproduced.

Charles Beenau, a linotype operator for the newspaper, and his assistant, Franklin Meno, spent 6700 spare time hours in constructing the model plant at a cost of $500. Materials used for construction included walnut and maple wood, celluloid, brass, zinc, paper, lead, etc. Special tools were designed by the two craftsmen in order to permit details of the plant to be cut from materials.



The exterior of the model newspaper plant is complete in every detail. The windows, columns, cornices, and other architectural features were made separately and then assembled in proper order.

Steam Challenges Diesel With New Locomotive

STEAM issues a defiant challenge to Diesel powered locomotives with a new stainless steel streamlined locomotive constructed in the Burlington, Iowa, railroad shops. The most extraordinary features of the new type locomotive are to be found in the driving rods that transmit power from its cylinders to the 6½-foot drive wheels.

The major obstacle in operating steam locomotives at very high speeds has been the terrific forces set up by the up-and-down and back-and-forth motion of the drive rods and attendant reciprocating parts.

To overcome this difficulty, experts took the latest development in alloy steels and roller bearings, and applied them to their problem.

This new streamlined steam locomotive is capable of a 125 m. p. h. maximum speed and a cruising speed of between 90 and 100 m. p. h. It is fueled with coal by automatic stoker.

Telegraph Transmits Colors

With this new device, colors may be transmitted by telegraph. Each color has its own characteristic graph curve. No two curves are exactly alike unless they are for the same color.

USING a new tool of science, research colorists now are sending color samples by telegraph. Known as "colorgram," these color samples represent the most accurate means of color transmission. By a complex photoelectric system, the device charts the color characteristics on a sheet of graph paper.

Powder Flame-Proofs Cloth

A NEW flame-proofing agent for cloth or paper, which does not change the feel or texture of the material treated, may be applied when the material is washed.

In the form of a powder, this flame-proofing agent may be mixed with the final rinse water. The material treated is not fire proofed but it is flame-proofed.

Pieces of cloth subjected to flame. The piece on the right has been flame-proofed and the one on the left has not. To apply to cloth, special powder is added to final rinse water.

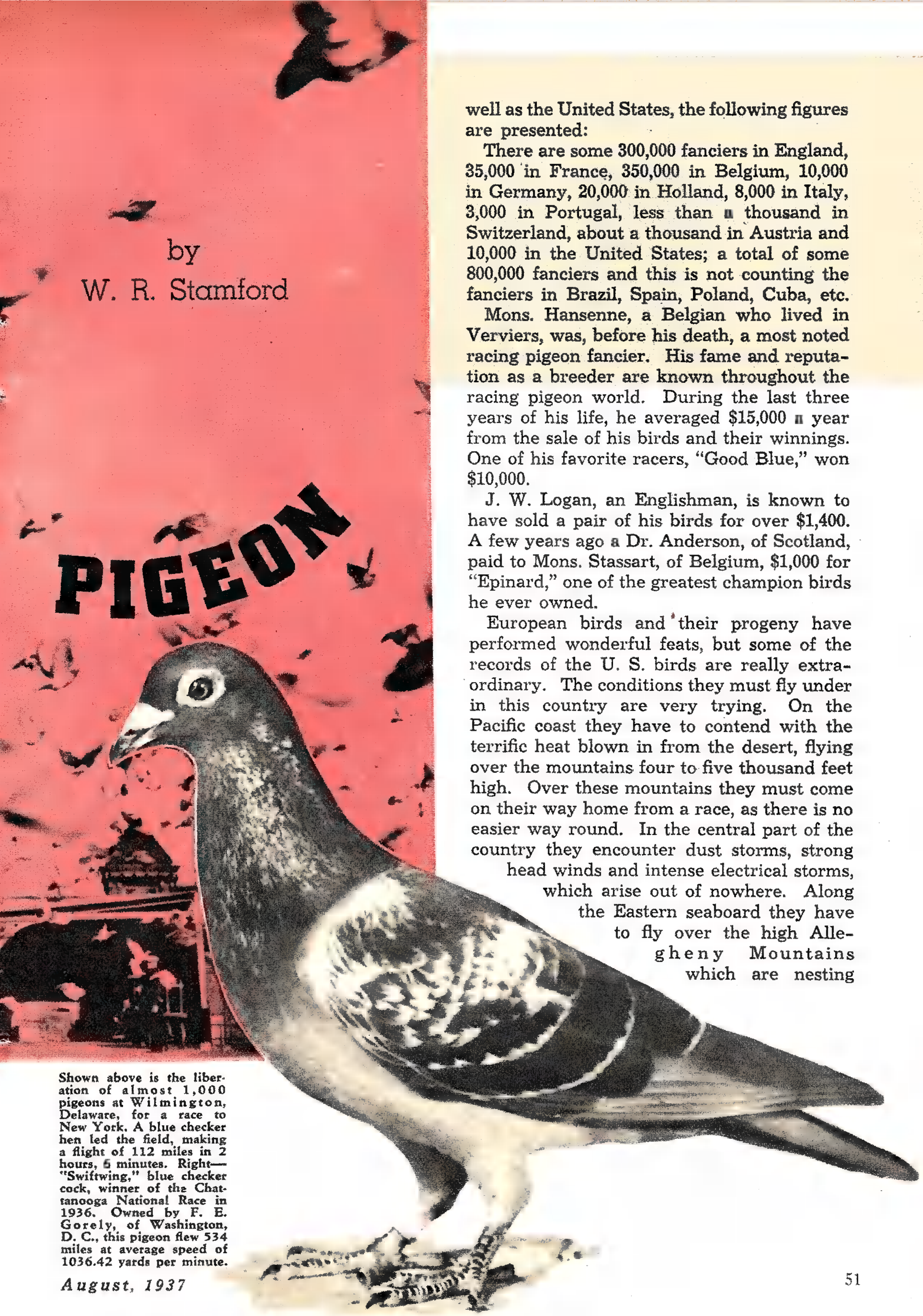
RACING THE HOMING

Thwarting human explanation for centuries, homing pigeons miraculously return to lofts many miles away.

RACING the homing pigeon is a very interesting sport, and yet there are many people who are unaware that such a sport exists although it is one of the leading sports in England, Belgium, Germany and other European countries. To give one an idea of the vast number of racing enthusiasts participating in this sport in these countries as

by
W. R. Stamford

PIGEON



Shown above is the liberation of almost 1,000 pigeons at Wilmington, Delaware, for a race to New York. A blue checker hen led the field, making a flight of 112 miles in 2 hours, 6 minutes. Right—"Swiftwing," blue checker cock, winner of the Chattanooga National Race in 1936. Owned by F. E. Gorely, of Washington, D. C., this pigeon flew 534 miles at average speed of 1036.42 yards per minute.

well as the United States, the following figures are presented:

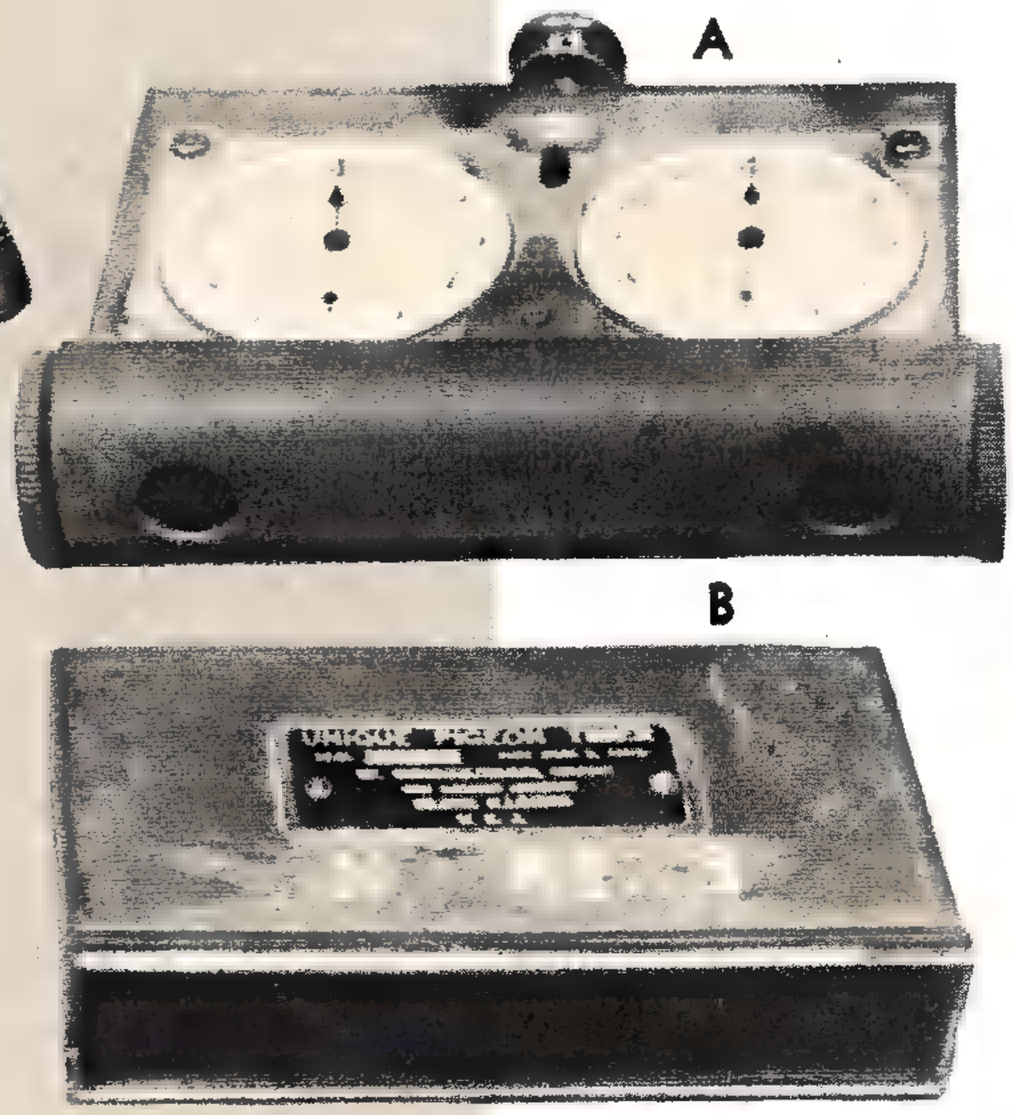
There are some 300,000 fanciers in England, 35,000 in France, 350,000 in Belgium, 10,000 in Germany, 20,000 in Holland, 8,000 in Italy, 3,000 in Portugal, less than a thousand in Switzerland, about a thousand in Austria and 10,000 in the United States; a total of some 800,000 fanciers and this is not counting the fanciers in Brazil, Spain, Poland, Cuba, etc.

Mons. Hansenne, a Belgian who lived in Verviers, was, before his death, a most noted racing pigeon fancier. His fame and reputation as a breeder are known throughout the racing pigeon world. During the last three years of his life, he averaged $15,000 a year from the sale of his birds and their winnings. One of his favorite racers, "Good Blue," won $10,000.

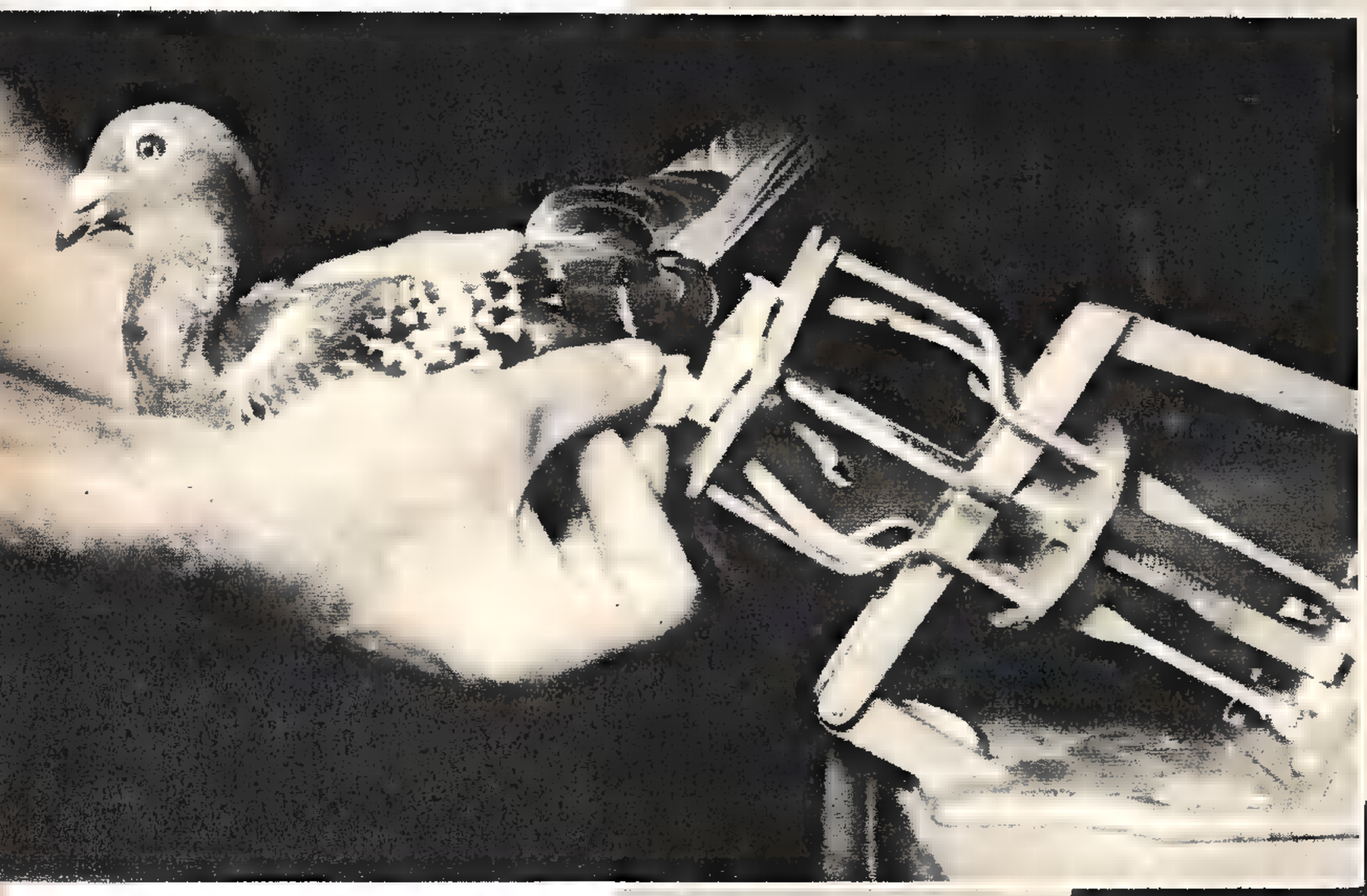
J. W. Logan, an Englishman, is known to have sold a pair of his birds for over $1,400. A few years ago a Dr. Anderson, of Scotland, paid to Mons. Stassart, of Belgium, $1,000 for "Epinard," one of the greatest champion birds he ever owned.

European birds and their progeny have performed wonderful feats, but some of the records of the U. S. birds are really extraordinary. The conditions they must fly under in this country are very trying. On the Pacific coast they have to contend with the terrific heat blown in from the desert, flying over the mountains four to five thousand feet high. Over these mountains they must come on their way home from a race, as there is no easier way round. In the central part of the country they encounter dust storms, strong head winds and intense electrical storms, which arise out of nowhere. Along the Eastern seaboard they have to fly over the high Allegheny Mountains which are nesting

Sealed timing devices (left) are used by pigeon fanciers' clubs. When a bird "homes" in a race, the fancier removes a countermark from its leg and places it in either of the timer's two holes. Turning a dial locks the countermark in timer and stamps the time on slip.



The important parts of a "stop and start" timer are shown above. When timer is to be used, the nut A is unscrewed from post. Both clocks are wound and case B is then slipped over timer and nut A replaced, a string and seal being attached to it. Returned pigeons' countermarks are inserted in the holes.



The manner in which pigeons are countermarked before a race is clearly shown in the photo at left. Notice how rubber countermark is stretched to allow the bird's foot to be placed through it. When the handle is released, the countermark automatically flies off prongs onto the bird's leg. Below — Countermarked, the bird is ready for shipment to the point of liberation.

grounds for fierce hawks. Is it any wonder why the racing pigeon fancier becomes so attached to his little feathered racers?

How are racing pigeons trained? When young racing pigeons are 7 to 10 days old a seamless aluminum band is placed on one of their legs. As the bird's leg and foot grows, the band will soon be impossible to remove. On the band is stamped, in raised letters and figures, the initials of the organization to which the fancier belongs, year of hatch, initials of the fancier's club, and a number.

At 12 weeks of age, when these young

racing pigeons—called youngsters—have become settled to their loft, they should be exercised 30 minutes or more each time they are let out of their loft by their owner. This exercise strengthens their wing muscles, develops the respiratory organs, and gets them familiar with the country surrounding their loft, developing their instinct.

Birds that are let out to exercise hungry should "trap" into the loft when they alight after the exercising flights. "Trap" is the racing pigeon fancier's word for birds entering the loft. If the birds were put out to exercise not hungry, they would soon get into the habit of loafing on top of the roof once they lit. This is the worst habit a racing pigeon can have, and unless it is corrected as a youngster, the bird is of no use to its owner. A pigeon race cannot be won if the bird sits on the roof when homing from a race.

Young birds should be ready for their first training "fly" at the age of four or five months. They are taken about a mile away from their loft in baskets and liberated. On these "flys" the birds are taken away hungry, so that when they return to their loft they will "trap" into it. The above distance is gradually increased to 15 miles, then to 25 miles, etc. After the birds are thoroughly trained up to 60 miles, they will in most cases be ready for their first competitive race, which is 100 miles. Old birds that have been inactive during the Fall, Winter and early Spring months will need a few training flights previous to the "old bird" race, to freshen their memory and sense of direction, but they, like the young birds, must exercise during the races.

There are two series of races every year for the fancier, provided he lives in a city where pigeon races are conducted. These series are known as the "old" and "young" bird races. The old bird races are for birds bred previous to the year in which they are to compete, while the young bird races are for birds bred the same year in which they are to compete. The old bird race schedule consists mostly of 100, 200, 300, 300, 400, 500, 500-mile hops and generally ends with one 600-mile race, although special races are sometimes held by clubs for longer distances such as 700 and 1,000 miles. This series of races starts about the first of May and

W. O. Maybury, said to be the oldest pigeon flyer in Pittsburgh, Pa., shrewdly inspects his champion bird before start of a race. The physical condition of a bird is only one of the factors that worry racers. Winds and type of terrain en route are equally important.

At Fort Monmouth, N. J., the U. S. Army Signal Corps maintains lofts (below) for breeding and training of pigeons. During the St. Mihiel drive in the World War, 567 birds were released with messages, attesting to their importance in large scale military operations.

Homing pigeons were used by both sides during the World War. Pre-eminent was the work of "Cher Ami," shown above. Liberated with an important message during intense machine gun and artillery action, this bird flew 25 miles to deliver its message. Examination showed that one leg had been amputated and its breast pierced by a machine gun bullet. The message tube, intact, was hanging by a ligament. Below—"Spike," another battle veteran.

continues until mid-summer. The young bird race schedule generally consists of 100, 100, 130, 200, 200 and ends with a 300-mile race, this series starting a few weeks after the old bird schedule is completed and lasting until the Fall months. Short races are flown in most cities on Sunday, and the longer ones on Saturday.

Birds that are entered in a race must be countermarked at the fancier's club house on the night preceding the day of the race on short races, and two nights ahead for longer races. A small charge is paid by the fancier for each bird entered in the race, a countermark being received for each bird. A countermark is a rubber ring with two different numbers stamped upon it—one number inside, the other outside. The countermark is attached to a stub of paper called the countermark stub, which has the same numbers stamped upon it as the marker itself. When a bird is countermarked, the countermark is placed on the bird's leg (by a hand-operated appliance made for this purpose) and at the same time the bird's band number is written on the stub from which it was removed. This stub is then placed in an envelope (which has the fancier's name on it) together with other

Just what prompts and enables pigeons to return to lofts located hundreds of miles away has never been satisfactorily explained. The birds are taught to believe that food can only be obtained at the home loft, but what guides them unerringly over mountains and plains to their respective lofts? (Photos on pages 54-55 by courtesy of the U. S. Army Signal Corps.)

stubs, if he is flying more than one bird, and sealed. All competing birds must be countermarked by this method.

The countermarked bird is then placed in the club's shipping basket. These baskets are of different styles and hold about 50 birds with space to feed and water them when they are on the longer races. Straw or shavings are placed on the bottom to keep them in a sanitary condition. When the shipping baskets are filled with countermarked birds, the doors are sealed shut with regulation club seals and sent to the railway express station. After the shipping costs for the baskets are paid to the express agent by the club secretary, they are then placed in charge of the convoyor who directs the placing of the baskets in the railway express car, which has been hired for this purpose by the various clubs. A convoyor is a person sent with racing pigeons whose duty it is to liberate them the morning of the race, weather permitting. On the long grinds such as the 300, 400, 500 and 600-mile races the birds are fed and watered in the baskets by the convoyor at the race site station on the day previous to being liberated.

How a liberation is conducted and prepared is told in *The American Racing Pigeon News* by a man who has convoyed Pittsburgh, Pa., pigeons for almost two decades:

"About four days before I make a trip

[*Continued on page* 124]

The two photos at the right show a close-up of one of the lofts at the Army Signal School at Fort Monmouth, N. J., and a series of the Army's extensive pigeon raising and training quarters. The pigeon's military value is established, the Japanese army maintaining 20,000 of them. Experiments are being conducted in which the pigeons wear tiny cameras strapped to their breasts, timed to take photos at regular intervals during their flights.

DOGS—
Diamond Guardians

Above—One of the trained dogs guarding the "blue ground" at the diamond mines in Kimberley, South Africa. Men patrol during the day and dogs take over the work at night.

Above—One of the watch dogs being trained to disarm a raider. A long training period prepares the dogs for the responsibility of protecting property. Left—One of the dogs beside a practice raider, dressed in heavy clothing.

by Lawrence G. Green

BARBED wire entanglements at Kimberley, South Africa, enclose a square mile of crumbled "blue ground" which still contains a fortune in diamonds. This private "El Dorado" is guarded by trained dogs.

Fifty men patrolled this area at the time when the whole output of the De Beers mines was left exposed to the weather before the diamonds could be extracted. Four men and a dozen dogs carry out the task at the present time, defeating all raiders.

Not that raids are frequent—the mere presence of the dogs is a strong deterrent. Criminals who might be tempted to scratch the rich earth at night see the dog training station every time they pass out of Kimberley along the main road. It is there as a warning.

When I visited the kennels recently I found Mr. Arthur Marsberg in charge—Marsberg the international footballer who went to England thirty years ago with the first Springbok team. Now Mr. Marsberg trains dogs with the same kindly skill that he once showed in training young footballers. Dogs were his hobby when, in 1928, De Beers decided to protect the property with dogs. And so Mr. Marsberg built up the efficient system that I saw within the barbed wire.

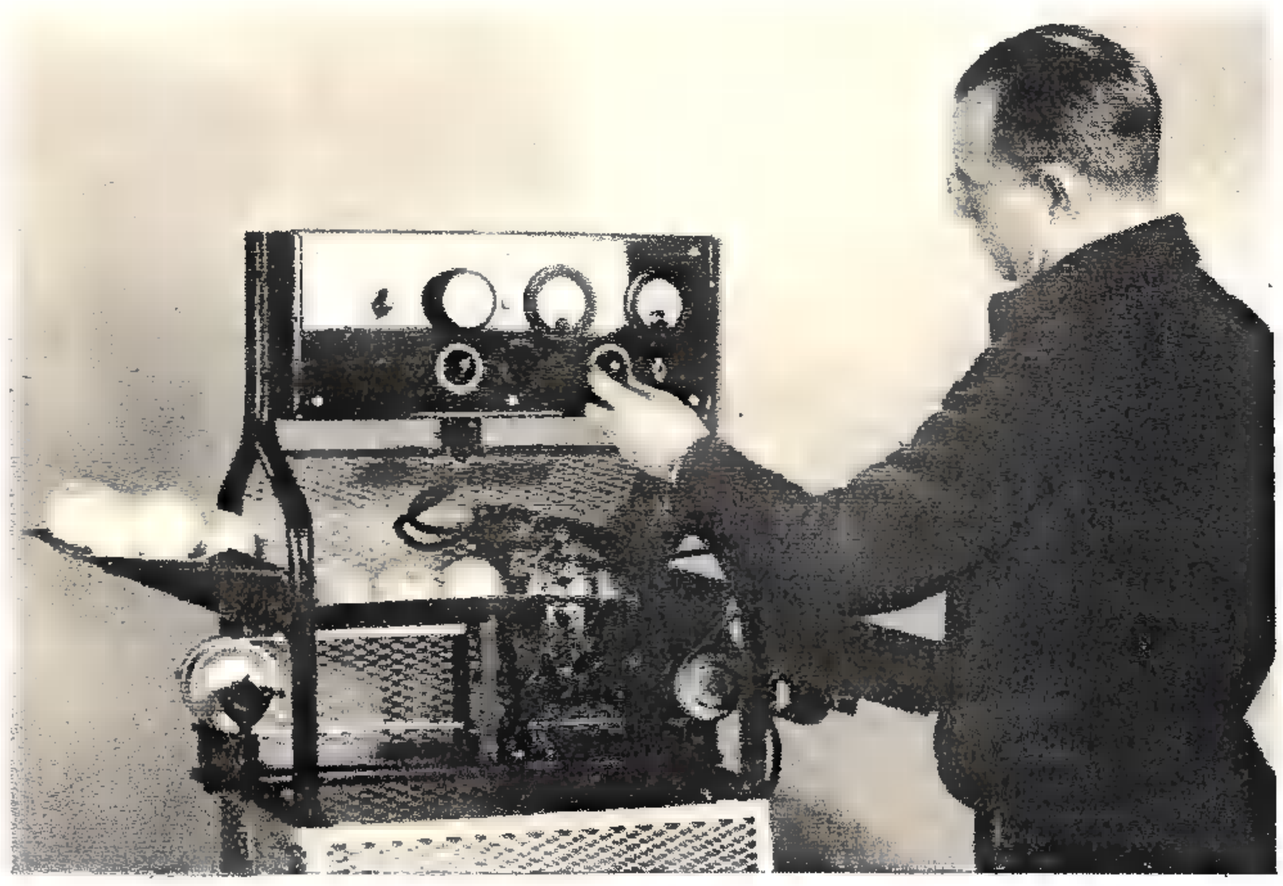
At first Alsatians were used. Today there

[*Continued on page* 153]

Electrical Device Examines Inside Of Fruit

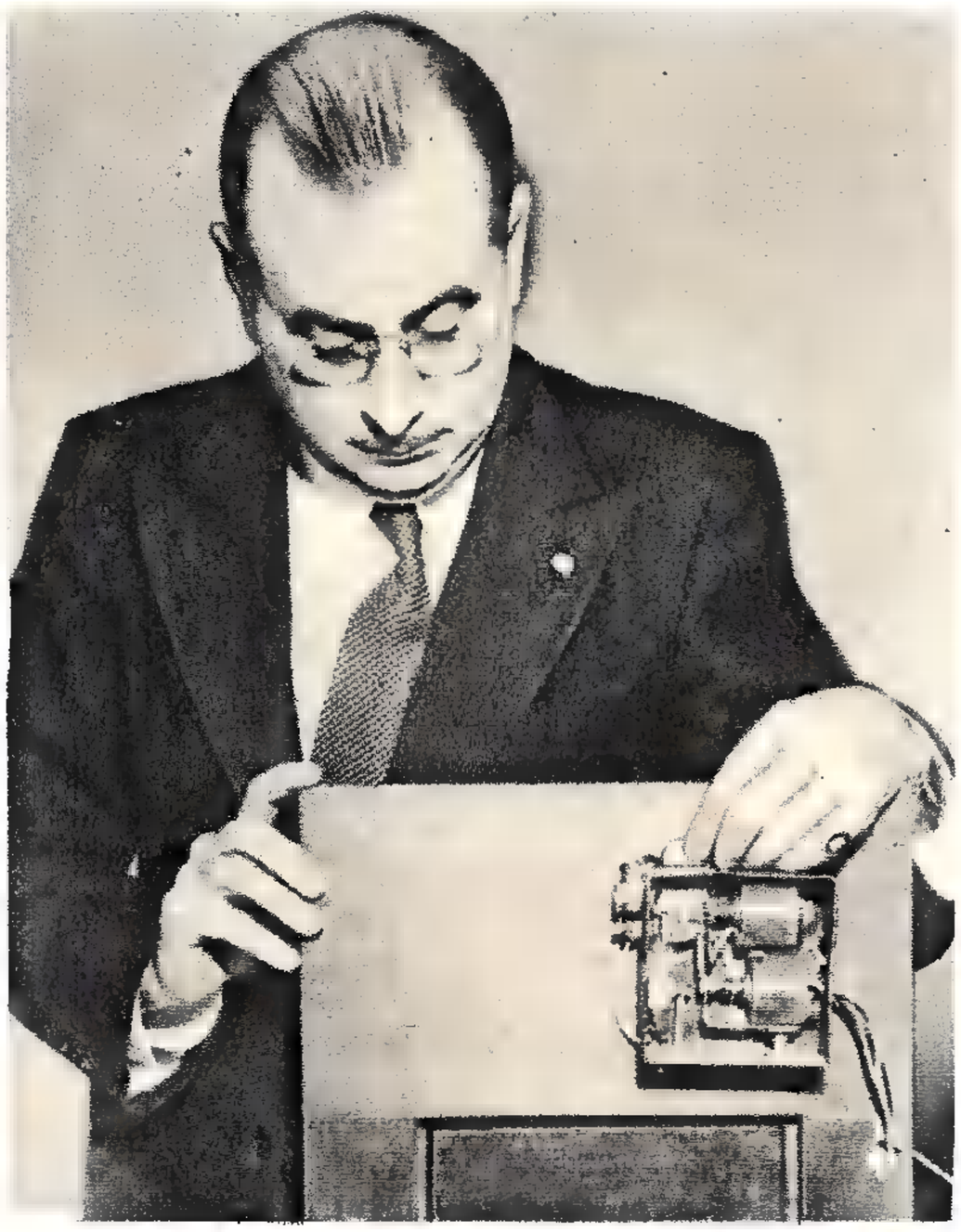
STRANGE "eyes" which "look" into citrus fruit to determine whether it is frosted and dried, or decayed, have been invented by Harold C. Pierce of Anaheim, Calif.

The machine's operation is based on the theory that damaged fruit has a different electrical resistance than good fruit. As the oranges, lemons or grapefruit pass along a conveyor belt they come in contact with ten energized "fingers." If energy passes through the fruit at a sufficient volume, it is shunted into the correct box.



Fruit passing through electrically operated device capable of determining, by resistance test, whether fruit is frosted and dried or decayed. Damaged pieces are shunted into discard.

Doorbell Demands A Nickel



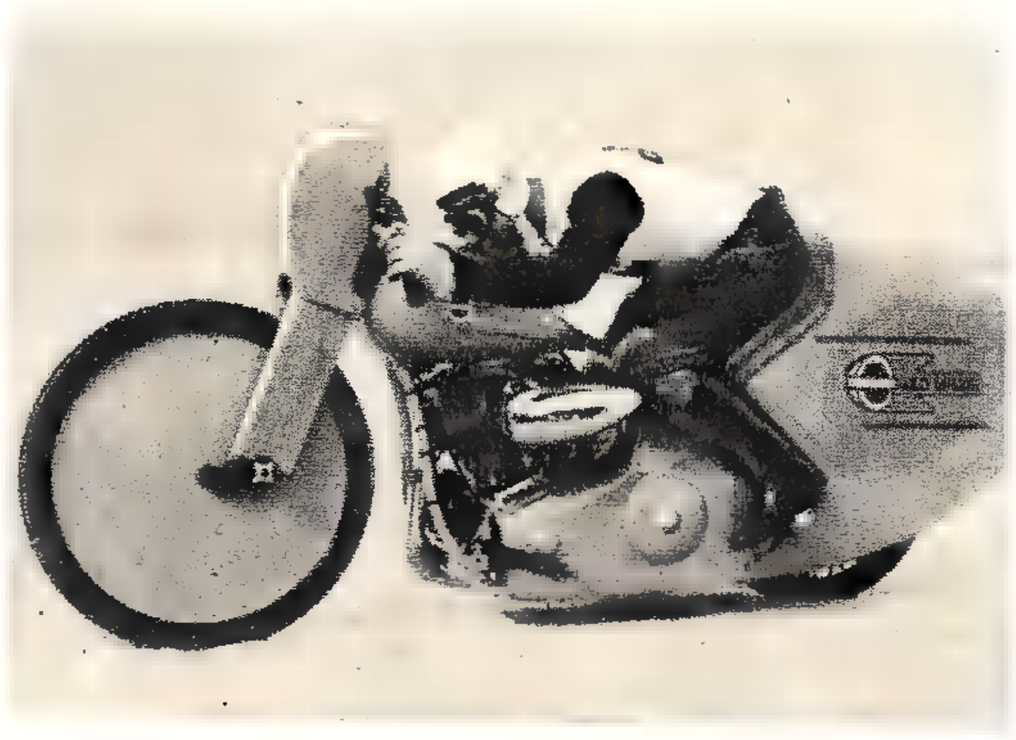
Conant Wait, inventor of the anti-door-bell-ringer, is shown with his device which requires that a nickel be deposited before bell will ring. Friends are reimbursed; others are not.

A LOS ANGELES attorney became tired of peddlers pushing his doorbell, so he invented a device making it necessary for them to deposit a nickel before the bell will ring. You can always reimburse your friends, says the inventor, but anyone else will have to pay just as if he called you on the phone.

Motorcycle Sets New Mark

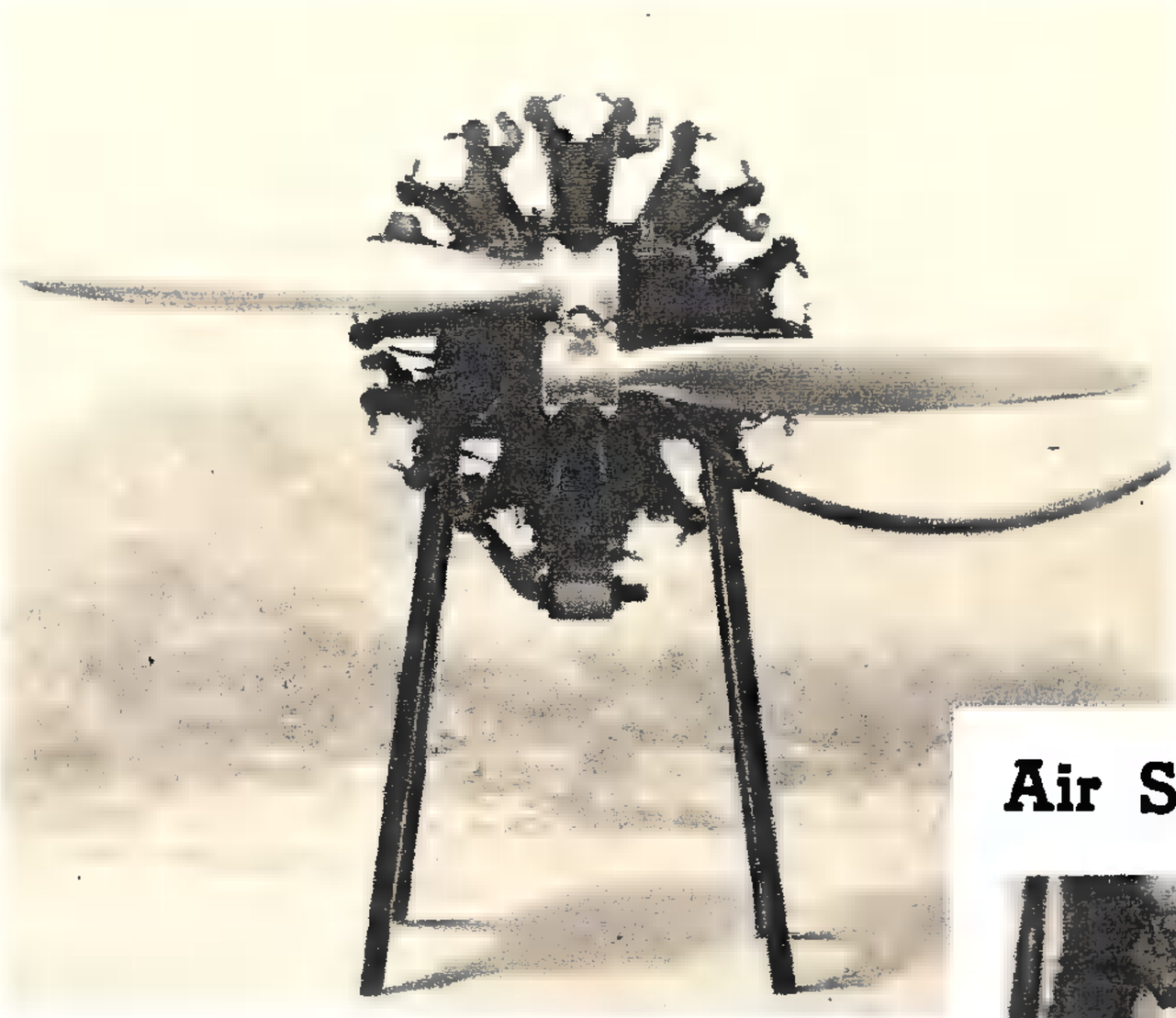
WHEN he set a new American Motorcycle Association record of more than 136 miles an hour, at Daytona Beach, Fla., Joe Petroli used a streamlined motorcycle. A fin, covering the rear wheel, and increasing the streamlined effect, gives greater stability to the machine.

The streamlined effect being carried throughout, the front wheel fork resembles an airplane landing strut. A wind deflector in front of the handle bars reduces the wind resistance which would normally be caused by the rider. As he bends below the top of this deflector, further streamlining is carried out during operation. Varying from the usual motorcycle design, the seat instead of being level, slants up at the rear.



A broadside view of the streamlined motorcycle which set a new speed mark at Daytona Beach, Fla. Streamlined rear also adds to stability of the machine at high speeds.

Novel Propeller Has Arced Blades Offset At Hub



The blades of this novel propeller are arced and offset at the hub. Better balance, resulting in smoother operation and increased efficiency, is claimed for the invention.

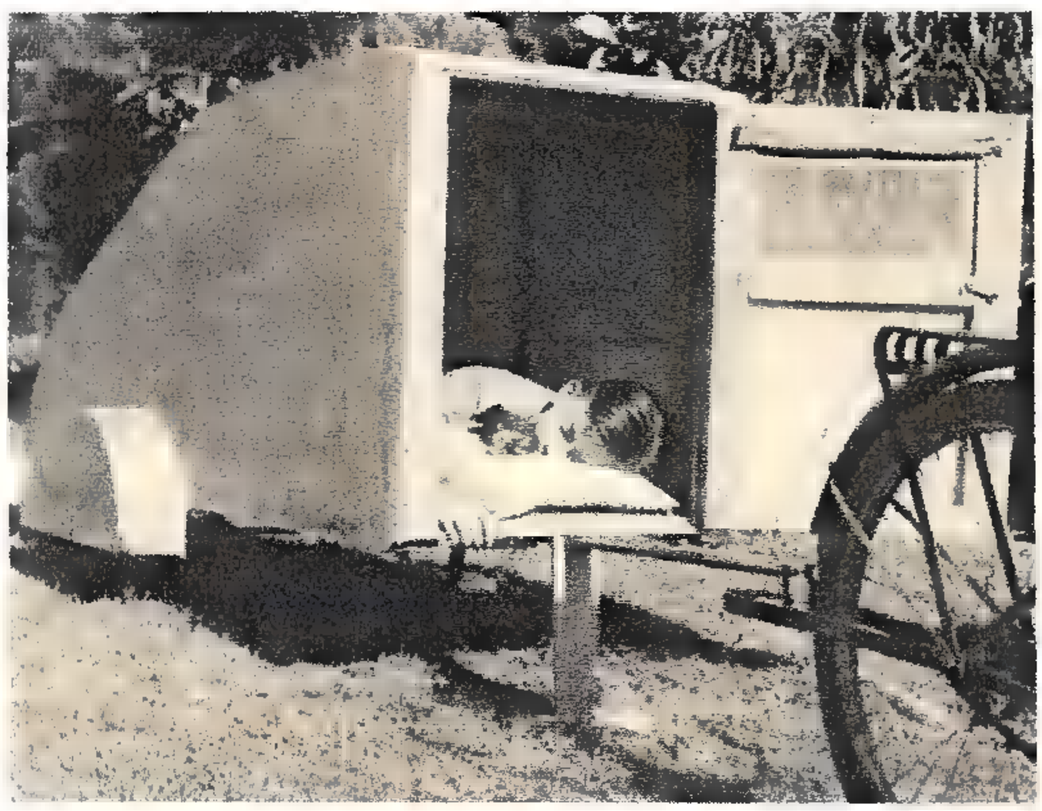
NEW in principle and design, an arc-bladed propeller has been developed by a Milwaukee, Wis., firm. Greater efficiency and performance are claimed for the novel arrangement of the blades.

The blades carry a decided arc and are offset at the hub. The arc acts to bring the point of propeller fatigue four inches nearer to the hub and the offset arrangement provides a better balance for the motor, reducing vibration.

Youth Builds Bike Trailer

NOT to be outdone by motor car trailer owners, Billy Roach, of Tampa, Fla., designed and built a bicycle trailer for use on week-end camping trips. Constructed of wood and wallboard, the trailer is 7½ feet long, 26 inches wide, and 33 inches deep.

Weighing 75 pounds, the trailer body is mounted on an axle equipped with 15-inch tricycle wheels. An air mattress and pillow provide all the comforts of home and a 6-volt dry battery furnishes current for an interior dome light and a tail light.



Hooked to a bicycle with a bracket that takes the place of a rear wheel stand, this trailer affords comfortable sleeping quarters for Billy Roach, of Tampa, Fla., who built it.

Air Suction Drives Machine

Blowing through a small tube, G. W. Johnston, 60-year-old inventor, demonstrates how air currents and air suction are utilized to move wheels of his new "perpetual motion" machine.

CONSISTING principally of four main wheels, three of which are nearly five feet in diameter and one-foot thick, a novel perpetual motion machine driven by air suction is claimed to have been invented by G. W. Johnston, of Tulsa, Okla.

Valves and other wheels are assembled inside the main wheel, each of which turns on a hollow axle. A turn of the wheel produces an air current at one end of the axle and suction at the other end, serving to keep the machine in motion. A small unit of the device, an eight-pound cylinder, can create eight horsepower under a 100-pound air pressure according to the inventor.

Trailer Shop Provides Livelihood For Cobbler

Starting with the idea of having a short vacation during which he could earn enough money to cover expenses, Ivan Symmonds mounted shoe repairing machinery in his home-built trailer. The novel shop attracted so many customers that he has been traveling for three years, doing business in towns en route. A 75-foot cable connects machinery with nearby electric lines.

DESIRING to travel around the country and to spend a vacation in Yosemite National Park while, at the same time, earning money to cover expenses, Ivan Symmonds, owner of a small shoe store near Reno, Nevada, hit upon the idea of carrying his business along with him. He loaded an electric stitcher, finisher, and other shoe repairing machinery into a home-made camp trailer, managed to reach Yosemite and, established at a campsite, hooked his machinery onto a 110-volt electric circuit.

Surprisingly, business flooded him. Instead of a short vacation, he spent a whole summer in the valley, working on hiker's boots and shoes, the vacationists giving him their business instead of making a trip to the towns outside the camp area. After leaving the campsite, isolated mining sites and small "cowtowns" furnished him with winter trade.

The traveling "shop" is seven by fourteen feet, with a six-foot headroom. The walls are masonite, the roof being plyboard, canvas covered and painted. The chassis is of extra heavy construction, being made of six-inch channel iron in order to carry the 3000-pound load of shoe repairing machinery.

Robot Parachutist Devised

HUMAN in appearance and life-like in its actions, a robot parachute jumper has been invented by Bill Kuhn, a professional parachutist of Sandusky, Ohio. The robot is designed to make delayed leaps from any designated altitude.

A clock-work motor activates the robot when it is hurled from an airplane, releasing the parachute by automatically pulling the rip-cord after a certain lapse of time. The mechanical jumper is six feet tall and weighs 160 pounds without equipment.

Inventions Needed in Field

An interview with Professor Colin G. Fink

Head, Division of Electrochemistry
Columbia University

by
Richard H. Parke

"THE young inventor looking for new worlds to conquer would do well to investigate the vast but little-explored domains of electrochemistry. Hundreds of new products and inventions difficult or impossible to discover during the countless ages of the past with mechanical skill alone are today readily possible through the combined power of electricity and chemistry."

Thus Professor Colin G. Fink of Columbia University presents an invitation — and a challenge—to inventive minds everywhere. He sees no reason why young men with courage and imagination should not play an important part in future scientific development and he believes his own field offers unlimited possibilities for advancement.

When I called on him in his laboratory at Columbia, I told him the readers of MODERN MECHANIX were particularly interested in needed inventions and I asked him to name a few of the problems which, in his opinion, demanded the greatest attention at this time.

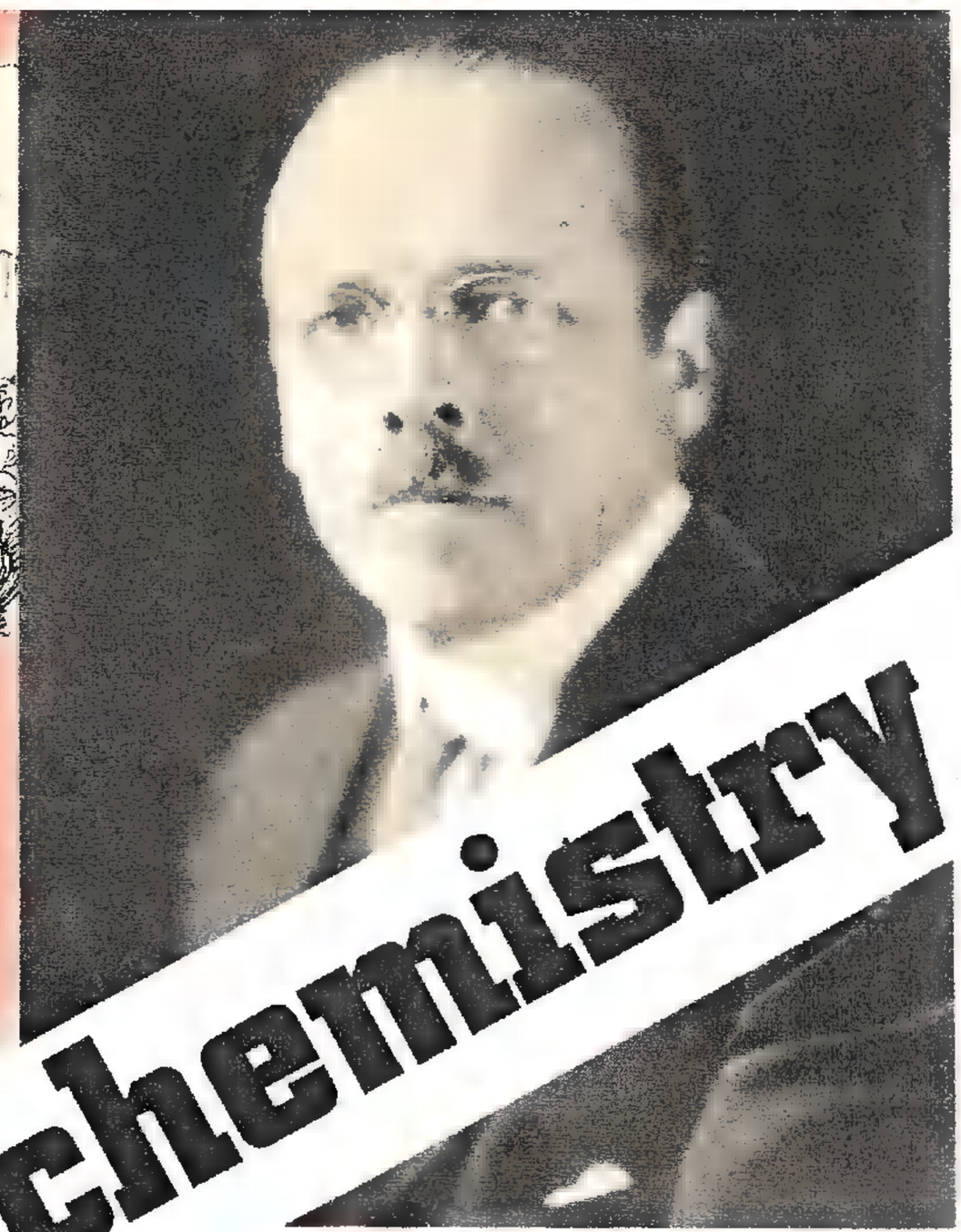
"Our basic engineering metal is iron," he began. "It is the most abundant and has the most valuable properties, such as high tensile strength, high fatigue value, etc. The world produces more of iron and steel than all the other metals put together. For every 100 tons of iron and steel, only 2 tons of copper are produced—and copper occupies second place in quantity and importance among metals!

"With ever rapidly increasing utilization of steel in railroads, automobiles, bridges, buildings, high transmission towers and other articles, the problem of eliminating rust and protecting steel products and costly structures against corrosion is undoubtedly the biggest problem confronting the chemist and engineer. Metals rust as a result of electrochemical action. If we eliminate this, we eliminate rust! The young men of the coming generation will solve this problem; marked progress towards a solution already has been made.

"We are also badly in need of an electric source of illumination suitable to our eyes which will operate at 90 per cent or better in efficiency instead of less than 10 per cent as at present. Electricity is modern man's indispensable and versatile servant; eliminate it and civilization would drop back 100 years. But, although electricity has increased the efficiency of old hand-operated machines and

Scientists are baffled in their efforts to release gold from sea water cheaply.

Through the application of electrochemistry, Professor Fink believes that the growth of fruit and vegetables can be greatly increased and that metals can be prevented from rusting and corroding.



# of Electrochemistry

Winner of the Perkins Medal of the Society of Chemical Industry and the Acheson Gold Medal for outstanding accomplishments in the field of electrochemistry, Professor Colin G. Fink now heads Columbia University's Department of Chemical Engineering. Discoverer of a platinum substitute used in manufacturing incandescent lamps, Dr. Fink seeks lamps that will be ninety per cent efficient instead of ten per cent as at present.

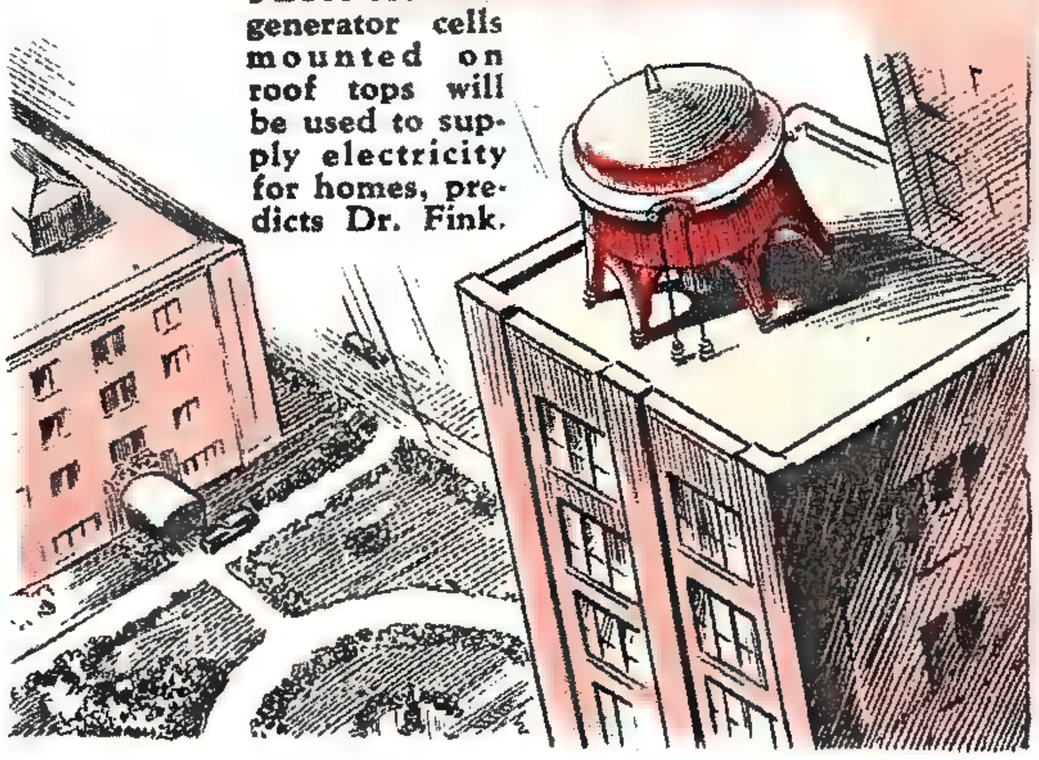


Photo-electric generator cells mounted on roof tops will be used to supply electricity for homes, predicts Dr. Fink.

innumerable devices a thousandfold or more, it has so far not accomplished anything near as much for artificial light.

"The tungsten lamp in the average man's home furnishes but 5 cents' worth of light for every dollar's worth of electricity. The balance, 95 cents, is lost as useless heat. Modern homes and towns need a lamp that will furnish at least 90 per cent light and only 10 per cent heat. The little firefly, or glow-worm, operates its light at figures even better than 90 per cent. The lamp of the future may very well be based on principles similar to those of the firefly's glow.

"A simple means of electrically controlling rainfall—keeping it out of the cities—is another important problem to solve. The Cottrell electrical precipitation process is used at factories all over the world to precipitate fumes, dusts, smoke and vapors of all kinds. It requires very little development to apply this same process to the precipitation of rain in localities outside of towns and cities. Millions of dollars' worth of shoes, clothing

[*Continued on page* 118]

RESTOCKING The

Federal Bureau of Fisheries takes unusual measures to balance inroads made by commercial fishers.

by
C. S. van Dresser

WHAT is probably the largest undertaking of its kind in the entire history of man has recently been completed, for, fantastic as it may sound, the ocean has been restocked by human efforts!

This gigantic task was accomplished by the Federal Bureau of Fisheries which states, in part: "If all of the fish planted by the Bureau in the past fiscal year in the Atlantic and Pacific Oceans and in lakes and rivers were to grow to maturity and be caught, almost every man, woman and child in the United States could have approximately six pounds of fish every week for a solid year from this source alone."

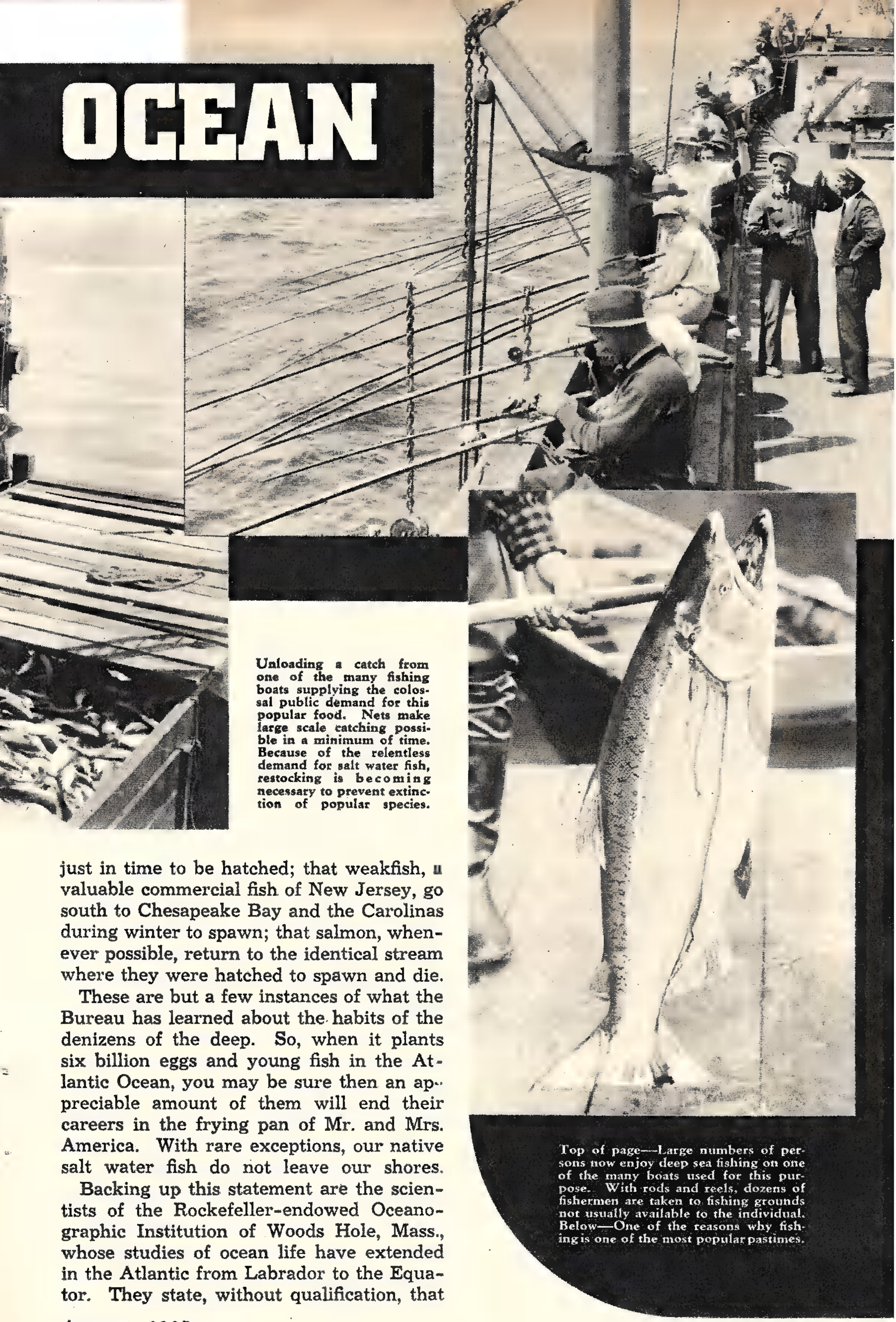
The total was slightly over eight billion, and was composed of eggs, fry and fingerlings of forty-three different salt and fresh water species from eighty-four hatcheries in thirty-eight states.

But why go to all this trouble to put fish into the sea? Restocking streams and lakes seems reasonable, but the ocean is a vast place, covering three-quarters of the earth's surface. Won't the salt water fish wander off to Europe or South America after they've been planted? How does the Bureau know that there will be any benefit reaped planting fish eggs and fingerlings in the boundless sea?

The answer is, and most definitely, that the Bureau does know what will happen to a good majority of the eggs and fish it releases in Old Father Neptune's domain. This knowledge came about after long and arduous study of ocean currents (known as oceanography) and years of so-called "tagging" of various fishes to learn their migratory and spawning habits.

The story of fish tagging is a tale in itself, but suffice it to say that by identifying fish by attaching tags on the fleshy part of the tail, or clipping certain fins and several other methods, the Bureau has unquestionably established many facts, such as: large quantities of codfish lay their eggs in Massachusetts Bay, and ocean currents carry them to the famous Georges Banks, 150 miles away,

OCEAN



Unloading a catch from one of the many fishing boats supplying the colossal public demand for this popular food. Nets make large scale catching possible in a minimum of time. Because of the relentless demand for salt water fish, restocking is becoming necessary to prevent extinction of popular species.

Top of page—Large numbers of persons now enjoy deep sea fishing on one of the many boats used for this purpose. With rods and reels, dozens of fishermen are taken to fishing grounds not usually available to the individual. Below—One of the reasons why fishing is one of the most popular pastimes.

just in time to be hatched; that weakfish, a valuable commercial fish of New Jersey, go south to Chesapeake Bay and the Carolinas during winter to spawn; that salmon, whenever possible, return to the identical stream where they were hatched to spawn and die.

These are but a few instances of what the Bureau has learned about the habits of the denizens of the deep. So, when it plants six billion eggs and young fish in the Atlantic Ocean, you may be sure then an appreciable amount of them will end their careers in the frying pan of Mr. and Mrs. America. With rare exceptions, our native salt water fish do not leave our shores.

Backing up this statement are the scientists of the Rockefeller-endowed Oceanographic Institution of Woods Hole, Mass., whose studies of ocean life have extended in the Atlantic from Labrador to the Equator. They state, without qualification, that

A Bureau of Fisheries scientist picking out unfertilized eggs preparatory to planting in suitable spawning grounds on the Georges Banks, off the New England coast. Six billion eggs were planted.

A Bureau rescuing unit salvaging fish trapped by overflow waters of the Mississippi River. More than 47,000,000 fish were saved in this manner during the past year and replanted up-stream.

Removing fish from overflow waters during floods, for transfer to other sections of the country. This work saves many million fish which might have been killed when the flood waters subsided.

marine life hardly exists over 200 miles from shore. In other words, our salt water fishes remain close to home.

The Bureau of Fisheries scientists know where and when various fish spawn, where they migrate to (when they do migrate) and act accordingly in their vast propagation activities.

Naturally you're not going to eat six or seven pounds of fish a week, unless you're more than crazy about sea-food or live in Alaska. So why this extensive planting of fish—the largest that the Bureau of Fisheries has ever accomplished in one year?

Take one of our best known commercial fishes—the cod, for example; for the past several decades we have consumed on an average of one hundred million pounds annually of this single staple marine product and practically all of it comes from the New England region alone! That gives an idea of the amount of fish we eat. Bear in mind the dozens of kinds of fish on the market today from our diversified and many fishing grounds, and it will be readily agreed that, taking the cod as an example, the American public consumes a staggering amount of fish.

By far the greatest fisheries in the United States are those off the New England coast. They extend, roughly, from the east end of Long Island Sound to Nova Scotia and the Newfoundland Banks. These grounds are more extensively fished than any others in the entire country. Huge fleets of fishing boats leave almost daily from Boston and Gloucester, Mass., and Portland, Maine, as well as numerous smaller ports. (The fish pier at Boston is the largest of its kind in the world devoted exclusively to receiving and packing fresh fish.) The aggregate catch of these ports is colossal.

Better equipped and more numerous boats are bringing in sea-food delicacies at such a rate that nature, lavish as she is, cannot keep up with the inroads man is making. Today the fishing fleets must make longer and longer trips to get satisfactory hauls. Several important species are becoming alarmingly

scarce. Yet the demand for cod, haddock, flounder, mackerel and other salt water products goes on relentlessly. This depletion does not confine itself to New England alone, for, according to Bureau scientists, it is true in varying degrees in practically all of the nation's commercial and sports fishing areas.

Perhaps the public does not realize the situation, but five years ago the Bureau of Fisheries foresaw that unless something drastic was done, our fisheries would within a short time face an economic crisis. This huge industry, with its ramifications, employing many thousands of workers, might conceivably cease to exist—and more than that—a tremendous source of food be denied the entire nation.

What to do? Only one thing—increase the number of fish in the ocean and inland waters—somewhat of a job, especially the former. Whereupon two great hatcheries of the Bureau, one at Gloucester, Mass., and the other at Boothbay Harbor, Maine, began collecting eggs from fish caught during the spawning season. Knowledge of the proper way to treat and handle the precious eggs grew with experiments, till today, the Bureau of Fisheries announces that it has planted the greatest number of eggs and fingerlings of salt water fish that it has done in any one year in its entire history.

Close to six billion potential fish dinners are now on their proper beds on the great Georges Banks and along the coast of Massachusetts and Maine, either in the fingerling and young fish state, or in the form of eggs, ready to hatch. A most stupendous accomplishment!

Cod and flounder head the list, the former with over two billion and the latter with a billion and a half. Pollock, a valued commercial fish resembling the haddock, makes its initial artificial spawning bow by placing third with over a billion. Haddock is represented by a mere 500 million, while the neglected mackerel has only an insignificant 100 million of its progeny planted

[*Continued on page* 122]

Young fish being disinfected at one of the Federal Bureau hatcheries. After these fingerlings are immunized against disease, they are released in waters suitable for their healthful growth.

Planting bass fry in fresh water lake. More than four million bass were deposited in lakes and rivers throughout the United States in the largest propagation program ever carried out by the bureau.

Bureau of Fisheries field man unloading fingerlings into a container preparatory to planting them in suitable water. There they will grow to maturity and stem the flow of many species toward extinction.

New Refrigerator Has Built-In Radio Receiver

New refrigerator with built-in radio in the top. Chromium knobs match hardware on refrigerator. With radio in kitchen, housewife may listen to her favorite program while working.

A REFRIGERATOR equipped with a built-in radio has been placed on the market. So popular was the first model that the manufacturer has made available a choice of several models in different sizes equipped with radio. This has been accomplished by having the radio mounted in the top of the refrigerator, and having the refrigerator constructed so that a top equipped with radio may be substituted for one without.

It has been said that the housewife spends sixty per cent of her time in the kitchen. Now by having a radio installed in the refrigerator, she may listen to her favorite program while working.

Because most radios are placed in the living room, one or two rooms from the kitchen, usually the housewife, when she is in the kitchen, finds it necessary either to miss a program or turn the volume up to a point where it is objectionable to the rest of the family. With this popular combination the housewife may work and listen at the same time.

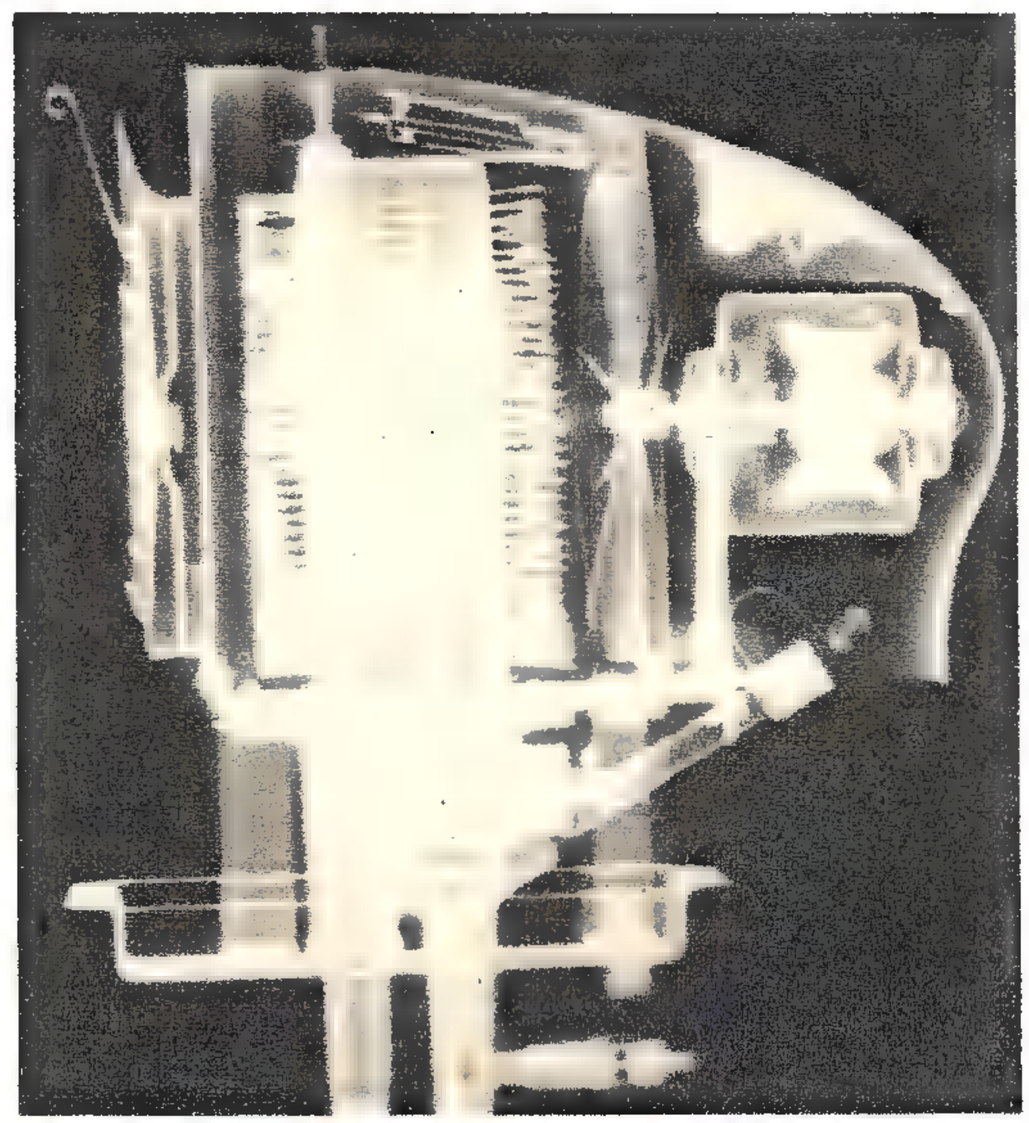
A NEW automobile heater utilizes gasoline vapor drawn from the carburator and ignited in a sealed metal combustion chamber. The hot gasses then pass into a completely sealed "oven" and are drawn off into the exhaust by suction.

Air from a fan is blown past heated fins surrounding the oven, and billows of hot air pour into the car ninety seconds after the heater is started. The photograph shown is the first radiograph of its type taken, and reveals the internal structure of the heater unit.

3,000 Pictures Per Second

BY MEANS of a new camera technique, 3,000 pictures per second can now be taken. When these pictures are slowed down to ordinary projection speed, it is possible to see action not visible without instrumental aid. High speed pictures show many unusual and interesting facts.

Car Heater Burns Gasoline



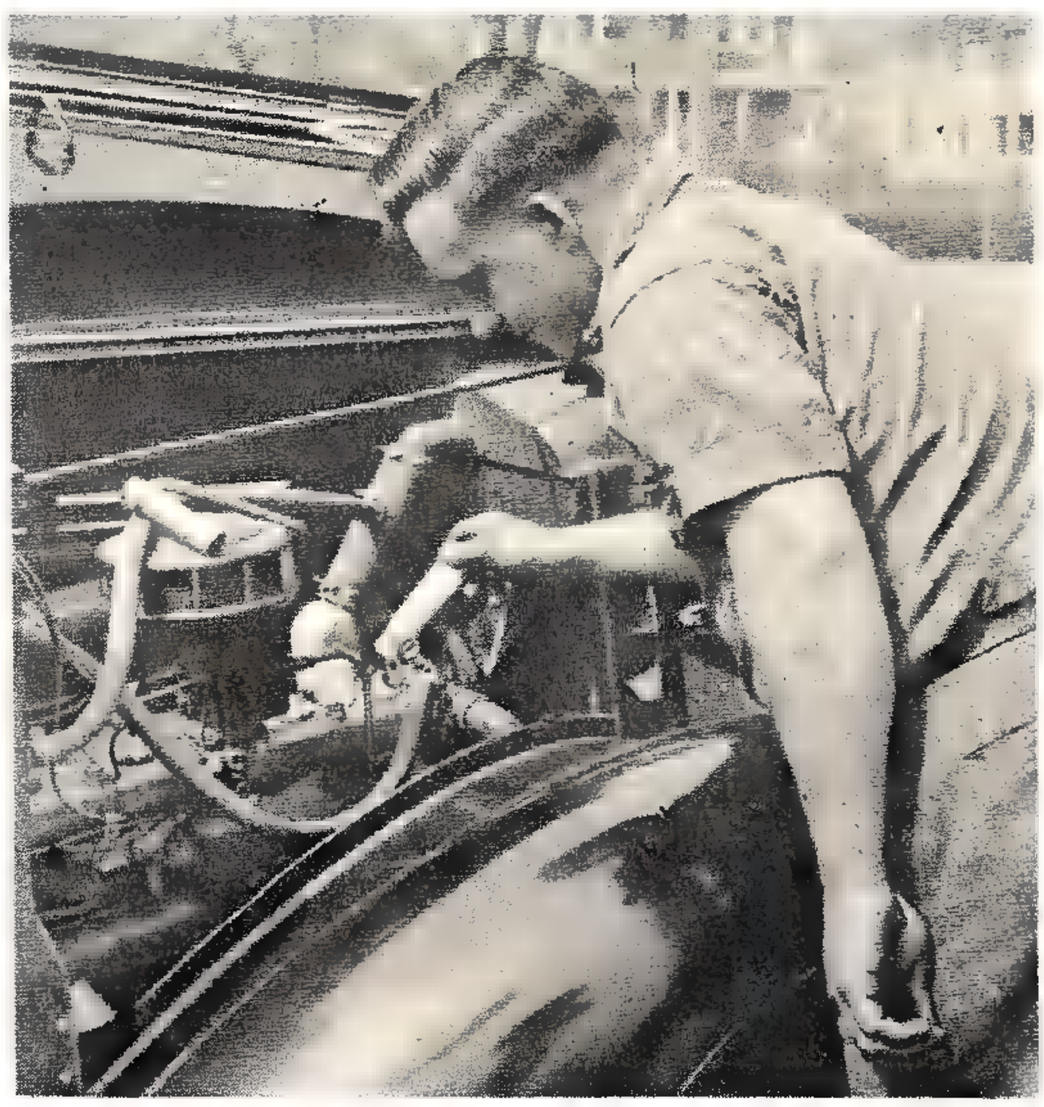
Radiograph of new heater utilizing gasoline vapor as its heat source. Vapor is drawn from carburetor to sealed combustion chamber. Burned gas leaves through exhaust pipe.

Machine Provides Permanent Wave In One Minute

A ONE-MINUTE permanent waving machine of new design has been developed by Ralph Shakour, Frank Feeney, and E. Riley of Springfield, Mass. The device features vertical heater elements that preheat thirty-six aluminum curler clips in groups of eighteen because the speed of the machine is so rapid it proved to be impractical to heat all the clips at the same time. The heater is divided into two units with safety switches and red safety lights. The clips are merely taken off the heater and placed upon the hair. By the time the eighteenth clip has been attached, it is time to remove the first one. The process of waving is then repeated.

Beauticians can provide their clients with permanent waves in record time with the new machine shown being demonstrated here. Aluminum curler clips are fastened to the hair after being heated only one minute on vertical heater elements of special design.

Paste Restores Compression



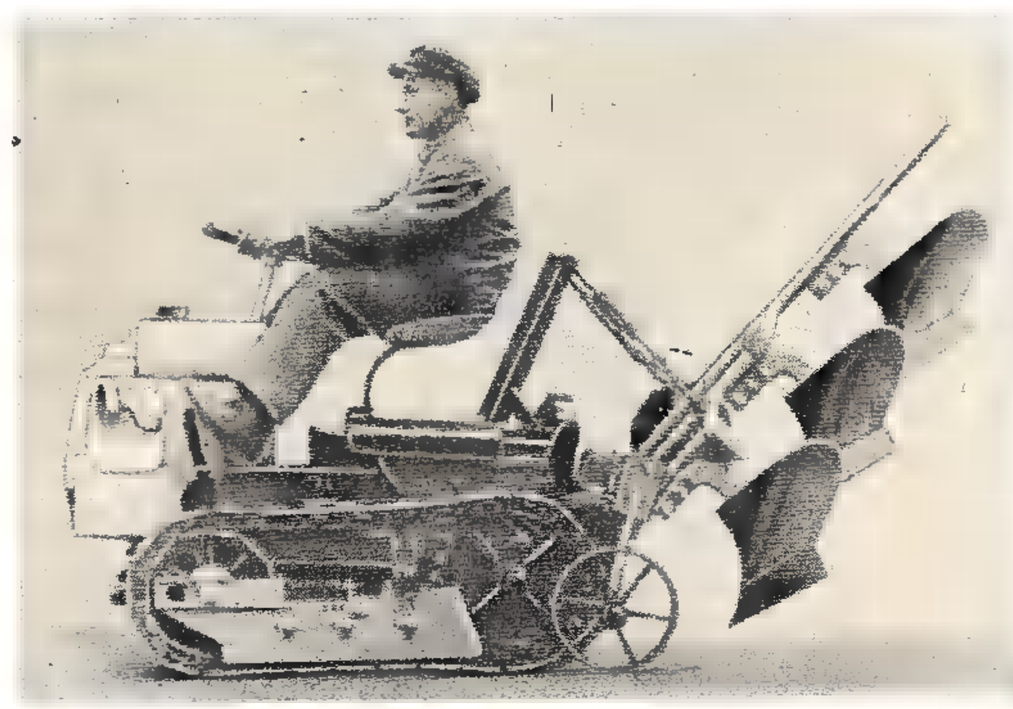
Easily injected into cylinders by means of a small rubber tube, a new refined mineralized paste is said to restore compression efficiency to auto engines having scored cylinders.

PACKED in a compact tube and injected into engine cylinders by means of a rubber tube attachment, a new paste product, claimed to function similar to the installation of new piston rings or new rings and a cylinder rebore, has been produced by a Kansas City, Mo., manufacturer.

The product consists of a mineral refined by scientific methods until it assumes the consistency of a paste. When applied to an engine with scored cylinders, the paste assumes a smooth, metallic hardness and tests indicate that the engine's compression efficiency is restored after about 400 miles of driving.

"Crawler" Uses 8 H.P. Motor

EQUIPPED with an eight horse power gasoline engine and possessing high tractive power, a compact farm "crawler" has been developed by a German manufacturer. The design of the machine enables it to be used to work narrow strips of cultivated ground even when located on heavily sloped land. By using special attachments, the machine can be used for ploughing, hoeing, digging, and other miscellaneous farm work.



Designed especially for farm work where narrow strips of land are to be worked, this "crawler" is equipped with an 8-horsepower gasoline engine and has great tractive power.

So You're Buying a House!

by
Alfred Dolid

ATTRACTED by the low prices made possible by large-scale, government-sponsored production, thousands of families of modest income are buying homes throughout the country. The summer of 1937 will see a building boom of unequalled size, according to realtors everywhere.

The advertised prices of comfortable five- and six-room houses appear so reasonable, and the terms of payment so convenient, that

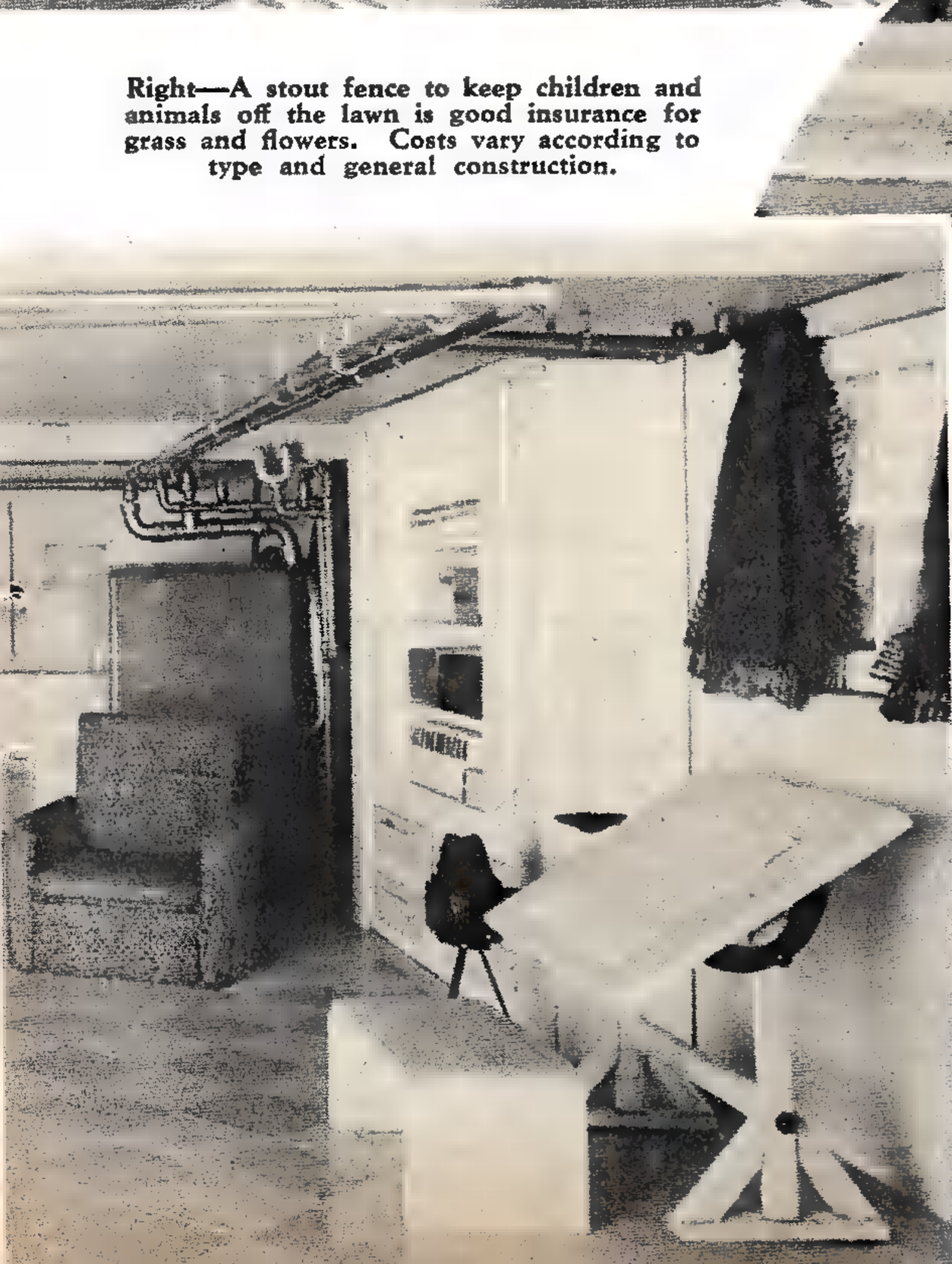
Above—Window screens for summer use are important comfort aids to the home owner. During the cold months, the screens should be replaced with storm windows, thus eliminating "cold zones" in the rooms. Right—A typical example of what can be done with an average cellar. Covered walls, floor and ceiling add a room to the house, suitable for any use. (Photo courtesy American Radiator Company's Castles Underground)

many people hurriedly purchase dwellings in desirable and rapidly filling communities and learn only afterward that the down payment and the monthly installments do not cover a really complete home; they discover to their dismay that the "extras" add up to a considerable sum, sometimes an appreciable fraction of the purchase price.

Builders have found that average prices of $5,000 for a one-story house and about $6,500 for a two-story structure draw the greatest number of prospective buyers, mainly because the carrying charges on these sums are smaller than rent for equivalent apartments. Such houses cannot include numerous accessories and attachments if they are to conform to the technical standards established by the government and still earn a legitimate profit for the builders. The latter therefore emphasize the minimum prices and simply do not mention the extras.

If you are in the market for a home, do not hesitate to ask many questions of the builders you meet. Start with the heating system, which is undoubtedly the most important single mechanical element in a home. You will be surprised to learn that standard equipment for the great majority of small houses is an old-fashioned coal furnace,

Left—Rock wool insulation, shown being installed in a top floor ceiling, is an efficient means of reducing fuel costs in winter and for lowering temperature in summer.



Right—A stout fence to keep children and animals off the lawn is good insurance for grass and flowers. Costs vary according to type and general construction.

Above — Venetian blinds are decorative and useful, especially for small houses whose windows are at street level. Right—The refrigerator is considered part of the house owner's personal effects and is not supplied with the new house.

with a galvanized iron tank operating off a separate pot stove for summer hot-water supply. If you want an oil burner and a modern non-rusting water tank, the builder will be glad to put them in—at an extra charge of at least $300.

A word of warning here. Don't install an oil burner in a furnace designed for coal, unless the fire chamber is so constructed that special baffle plates can be inserted. Otherwise, most of the hot gases will be pushed up the chimney by the forced draft of the oil burner, and your oil bills will be an unending headache. Insist on a furnace made specifically for oil heat, and make sure that the quoted extra cost includes the fuel tank, an upstairs thermostat for steam control, and another thermostat in the water chamber of the furnace itself for year-round automatic hot water supply.

What about insulation? Without it, the upper rooms will be chilly in winter and stuffy in summer. As the bedrooms and the bathroom are on the upper level, the family will be very uncomfortable unless the furnace is kept running almost continuously. You can easily pour any of the mineral type insulating materials between the attic floor beams after the house is finished, but getting it into the walls or the roof calls for the services of expert blowers. The time to think about insulation is when the house is being built, or at least before the walls and upper ceiling are plastered. Putting it in then is easy.

The cost of complete attic and wall insulation depends on the size and the construction of the house. A completely detached home, say of the usual two-story, six-room type, should have the attic floor and at least the upper outside walls insulated; the lower walls should also be done if the extra cost is not objectionable. An attached house, with other houses on both sides, will require treatment only on its front

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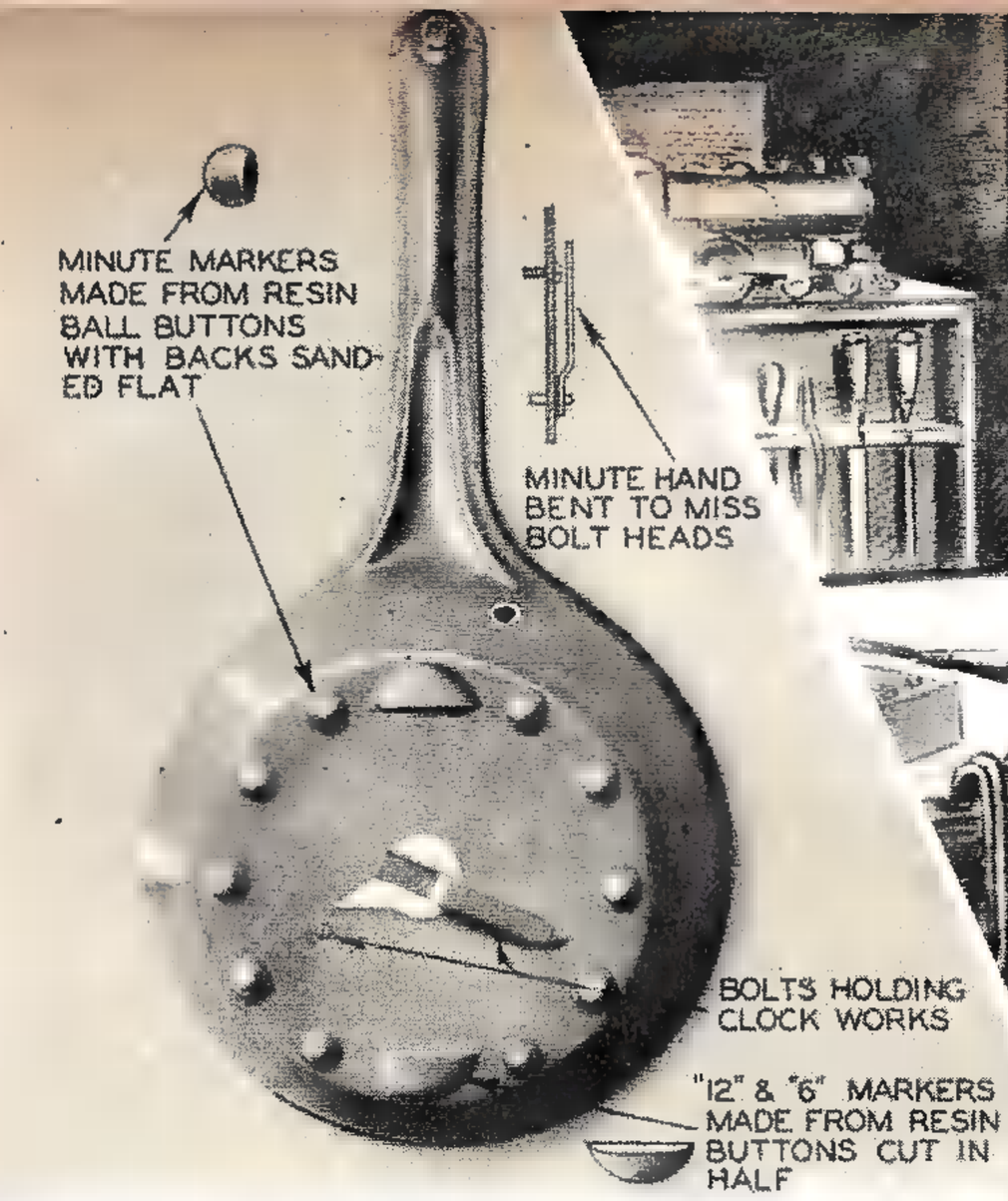
Although the radiators may be supplied with plenty of steam, the room may remain cold. Many times this is caused by poor insulating qualities of the walls.

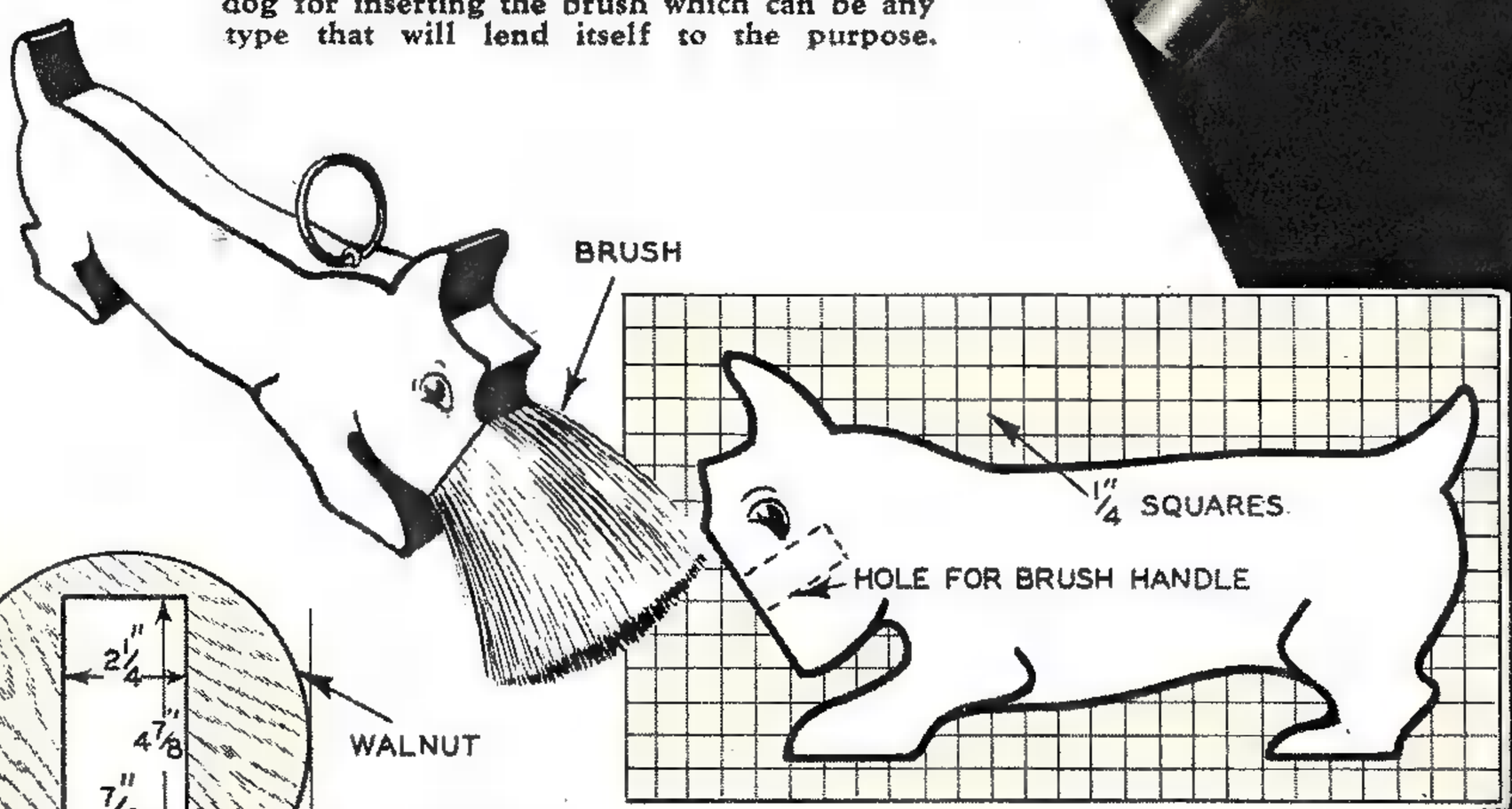
Workshop Hobbies

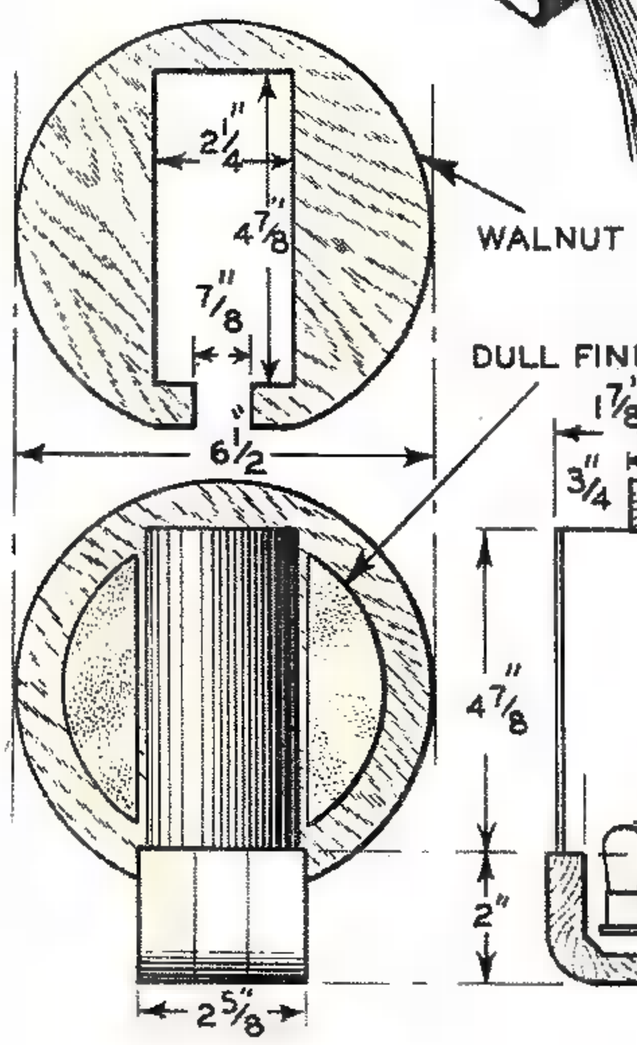


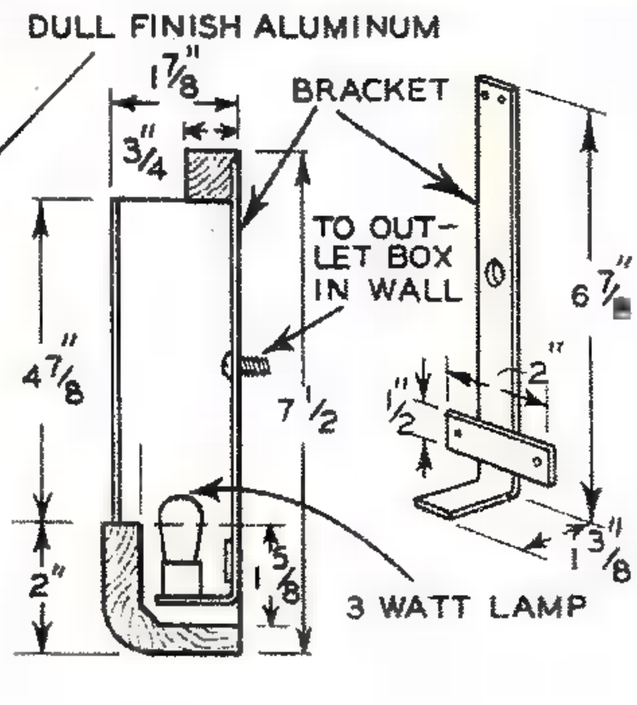
An old alarm clock mechanism mounted in a skillet makes an attractive home decoration and timepiece. Round dress buttons, cut in half, serve as hour divisions while hands are cut from scrap pieces of tin or aluminum.

Made from an old .22 calibre rifle, this distinctive pirate's pistol makes a novel decoration for a boys' room or den. Cut off the barrel at the point indicated in the upper diagram and file the end smooth. Next, remove the gunstock and saw it down at both ends to form a pistol grip. Finish the grip by sanding smooth rough edges and applying one or two coats of varnish stain.

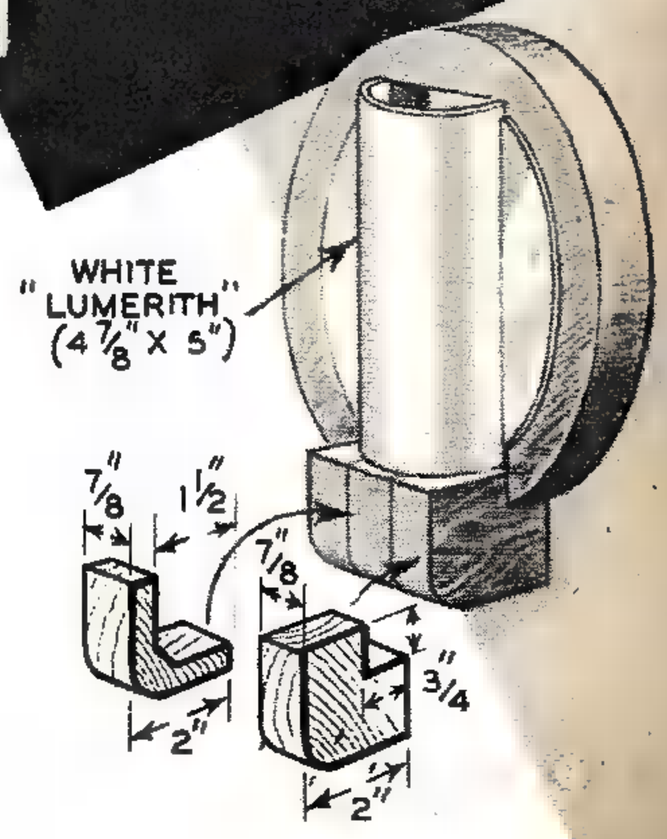
This novel "Scottie" brush can be put to many uses about the home. Cut out the body of the dog from a piece of 1"x2½"x6½" hardwood, on a jig saw, by following pattern shown below. Drill a 1½" hole in the head of the dog for inserting the brush which can be any type that will lend itself to the purpose.





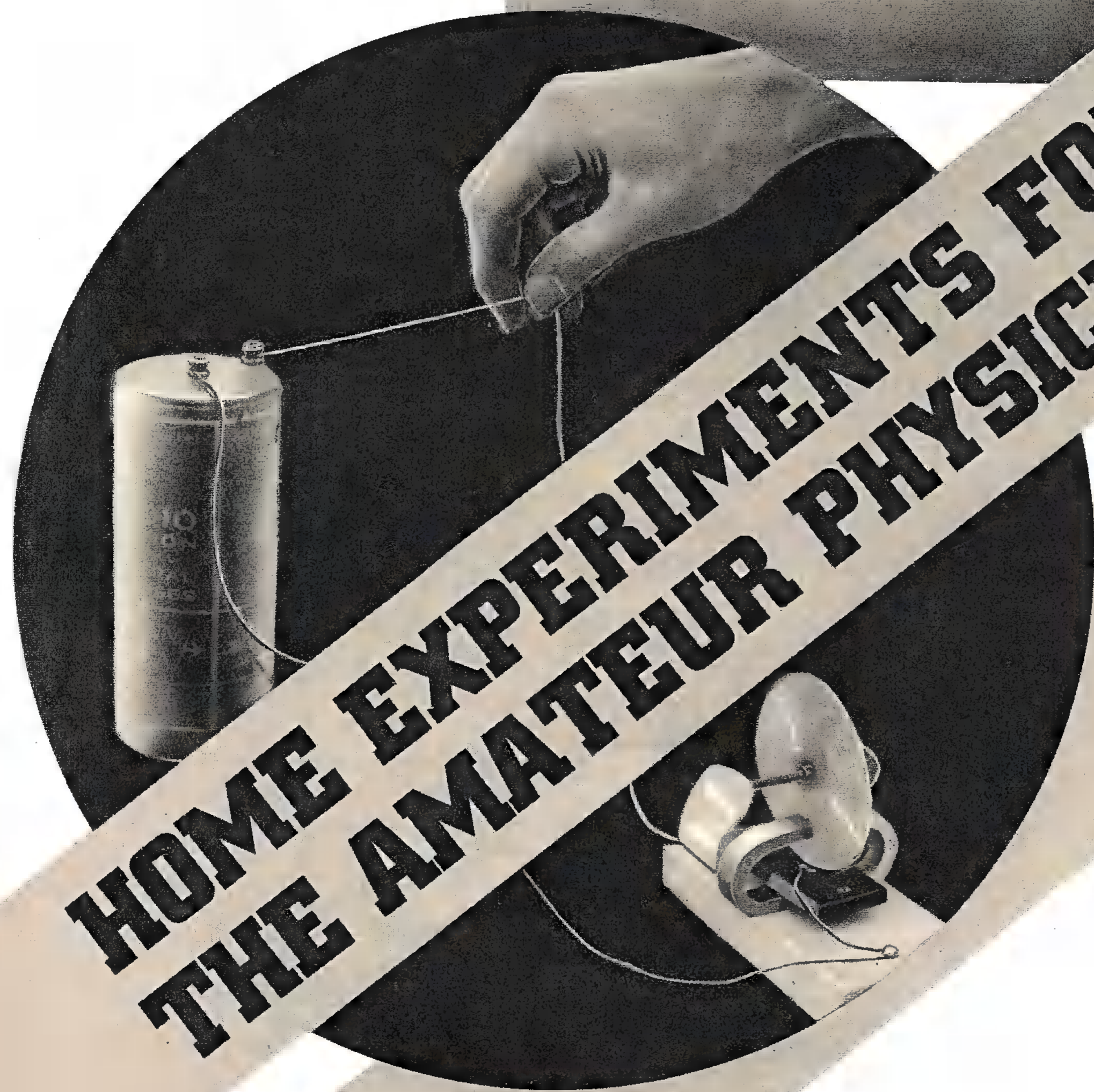


Illuminated wall brackets can be made in the home workshop at a cost that is trivial. Make the disc and lamp mounting from walnut, cutting the stock to the shapes and sizes shown. Attach curved aluminum decorative strips to the walnut disc for holding in place the lamp shade. The shade is formed from a piece of opaque celluloid or "Lumerith", bent "U" shape. Fit the completed lamp with a small three watt bulb.

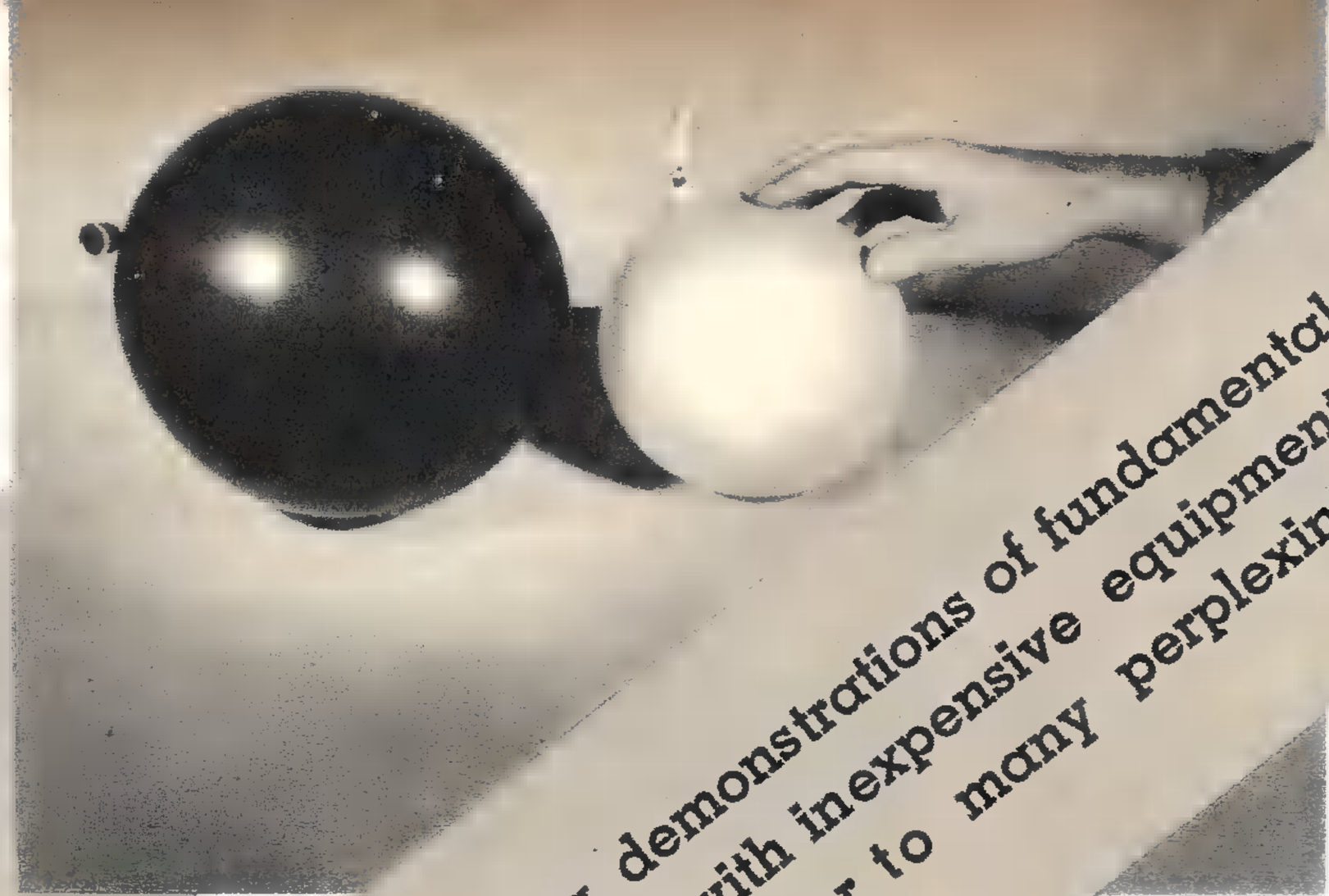


DEMONSTRATE STEAM'S HEAT TRANSMISSION QUALITIES—Water in a test tube is boiled and the steam carried into a glass of water by means of a rubber tube. In a short time the water in the glass will be heated although the condensed steam has added very little water to that already in the glass. Steam in addition to being hot gives up a large amount of heat when it changes to water.

HOME EXPERIMENTS FOR THE AMATEUR PHYSICIST

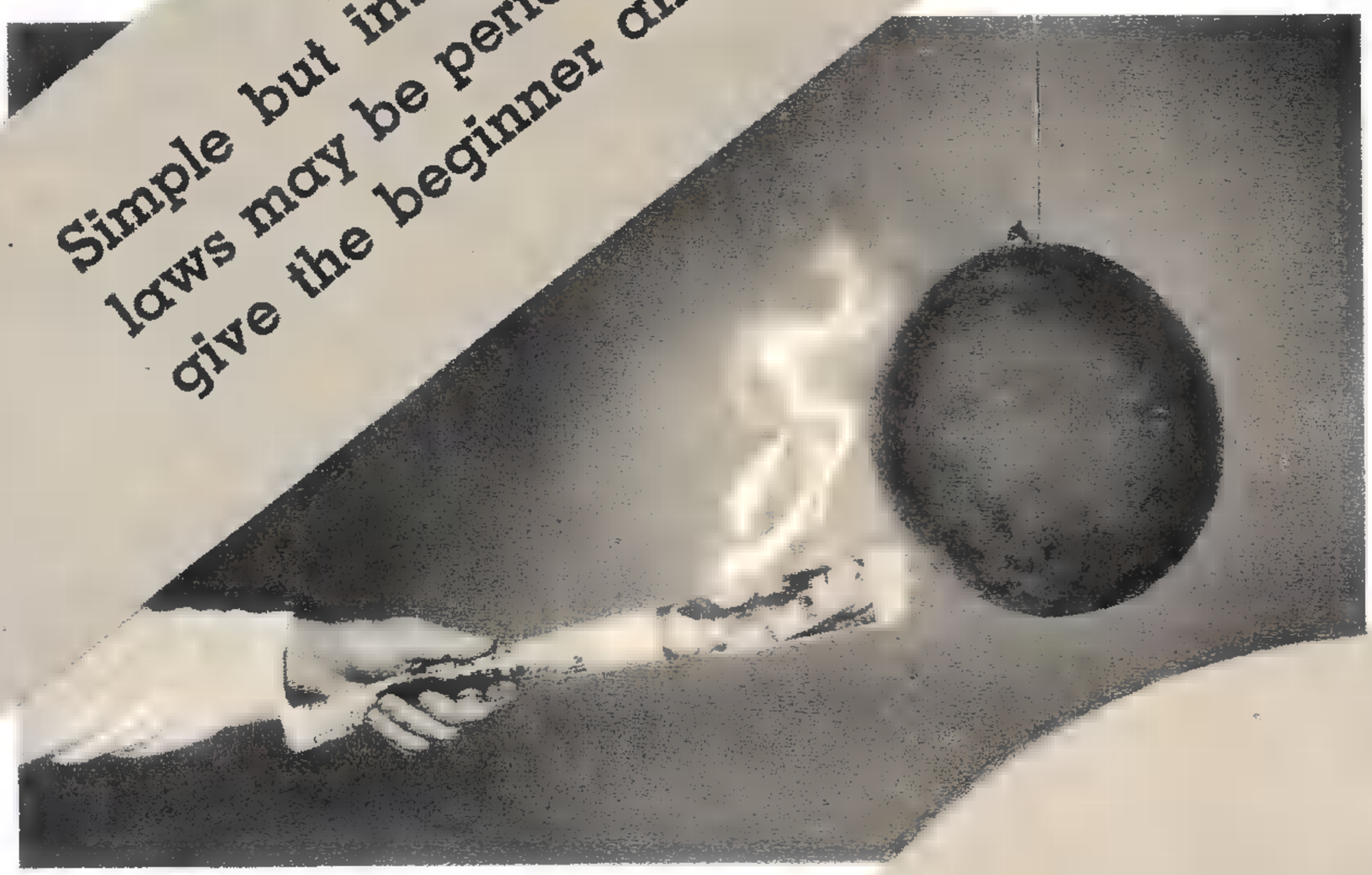


A REVOLVING COPPER DISC—A copper disc will revolve between the poles of a magnet if direct current is allowed to flow from center to edge or edge to center of the wheel. A drop of mercury supplies the contact for the current at the lower portion of the rim although very light contact with a piece of wire also will work. The disc revolves because the part of the disc carrying current between the magnetic poles is constantly being pushed aside by the magnetic field.



Simple but interesting demonstrations of fundamental physics laws may be performed with inexpensive equipment and will give the beginner an answer to many perplexing problems.

BALLOON LOSES HYDROGEN FASTER THAN AIR—The balloons in the photograph originally were the same size. After fifteen hours they were as shown. The small one contained hydrogen and the large one air. The hydrogen molecules pass through the rubber with less difficulty than air molecules because of their being smaller in size.



DILUTE HYDROGEN EXPLODES—Fill two balloons with hydrogen. Ignite one as shown in the photograph. It will blaze up with a puff of smoke. Permit the other to stand for several hours and then ignite in the same manner. This time it will ignite with a sharp "bang," indicating that air has mixed with the hydrogen.

MIRROR REFLECTS HEAT—To demonstrate heat reflecting qualities of a mirror use metal one instead of glass. A piece of shiny tin will be satisfactory. If a piece of glass is held in front of the heater, it will be found that it will stop the heat rays just as effectively as did the sheet of opaque material.

CAN THE SKY WITH THIS

The pride of having constructed this instrument will add new pleasures to star study.

by R. DeWitt Miller

PART I

THERE is no field open to the home craftsman which gives more lasting and satisfying results than the making of reflecting telescopes.

A simple six-inch reflecting telescope, the construction of which will be described in this series of three articles, will open up a glorious celestial world and give the star-filled vastness of the night a new meaning. The study of the heavens enrichens any man's life.

Such a six-inch reflector will show the polar caps on Mars, the unearthly beauty of the moon phases of Venus, the moons of Jupiter, the rings of Saturn, and the companion star to Polaris. It will split "double" stars. Through it the moon becomes a close neighbor, only a little way out in space.

There is another, and equally satisfying, side of telescope making. That is the joy of dealing with scientific accuracy so exact that it makes the average home workshop project seem gross and almost crude. To see your handiwork pass a test which is accurate up to a millionth of an inch is a deep and lasting thrill.

Add to these factors the fascination of the work itself and the fine friendliness which exists among amateur telescope makers and you have a combina-

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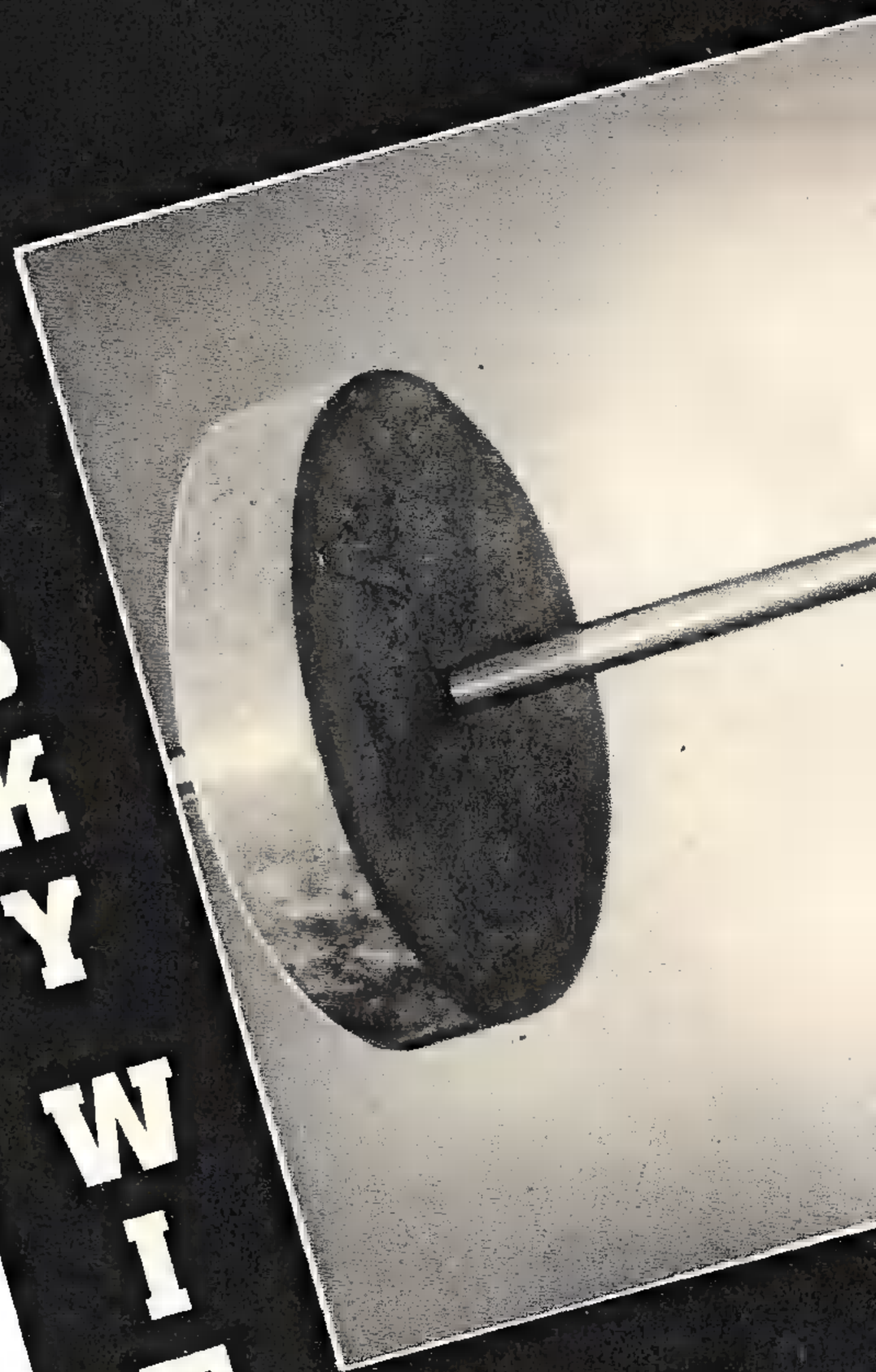
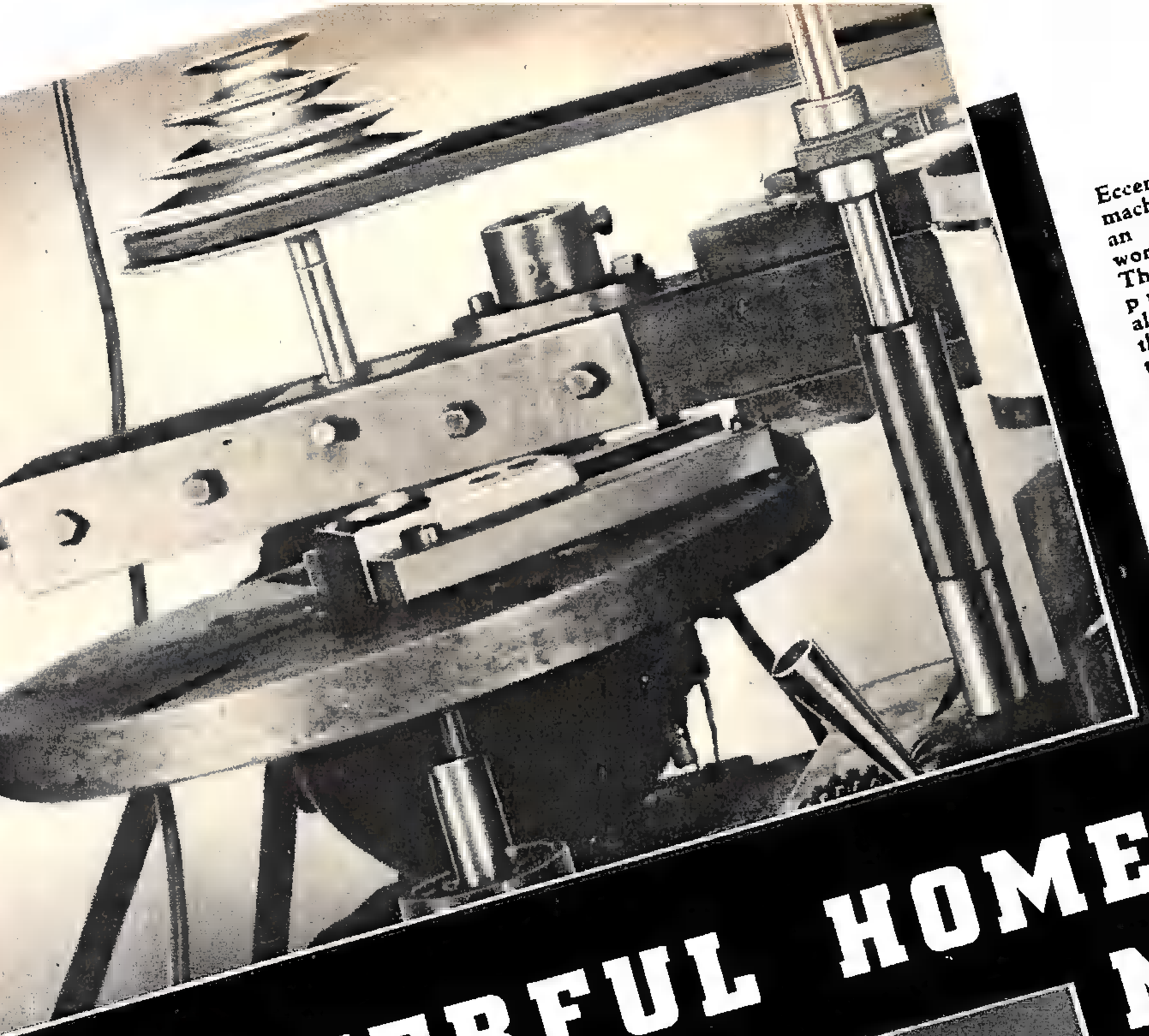
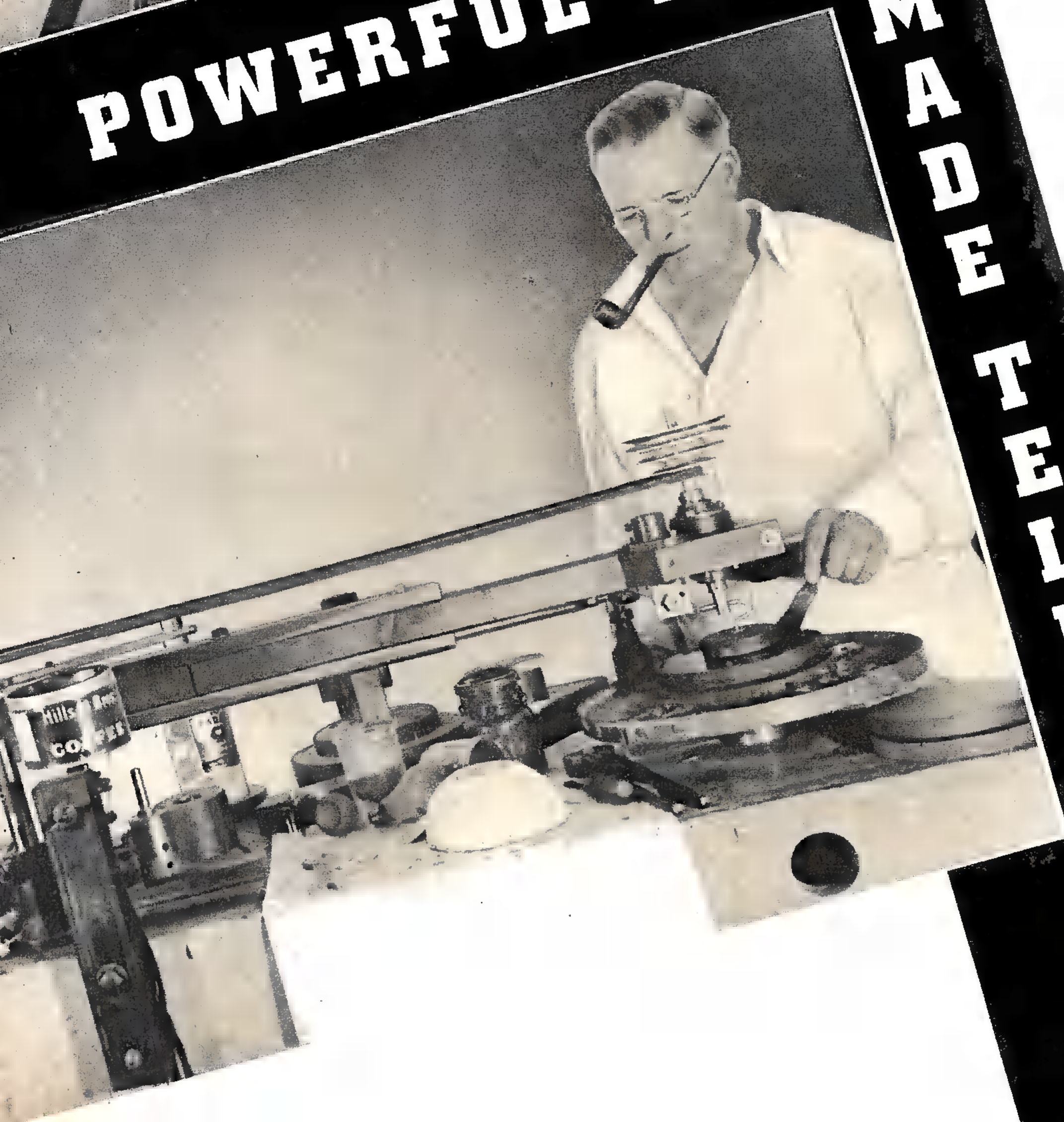


Grinding machine set for "spot grinding." The grinding table is at the right. More than a dozen mirrors of different sizes have been ground and polished on this device. For normal grinding, pulleys and belt are removed. The eccentric table turns at sixty r.p.m. and the grinding table at two r.p.m. Gears and motor are placed beneath table.



Eccentric of grinding machine constructed by an amateur telescope worker of Los Angeles. The shaft carrying the pulley may be slid along the slot beneath the grinding arm so as to give the eccentric motion for normal grinding and polishing. The pulley and the belt are removed for normal grinding. The photograph was taken when the machine was set for "spot grinding."

POWERFUL HOME-MADE TELESCOPE

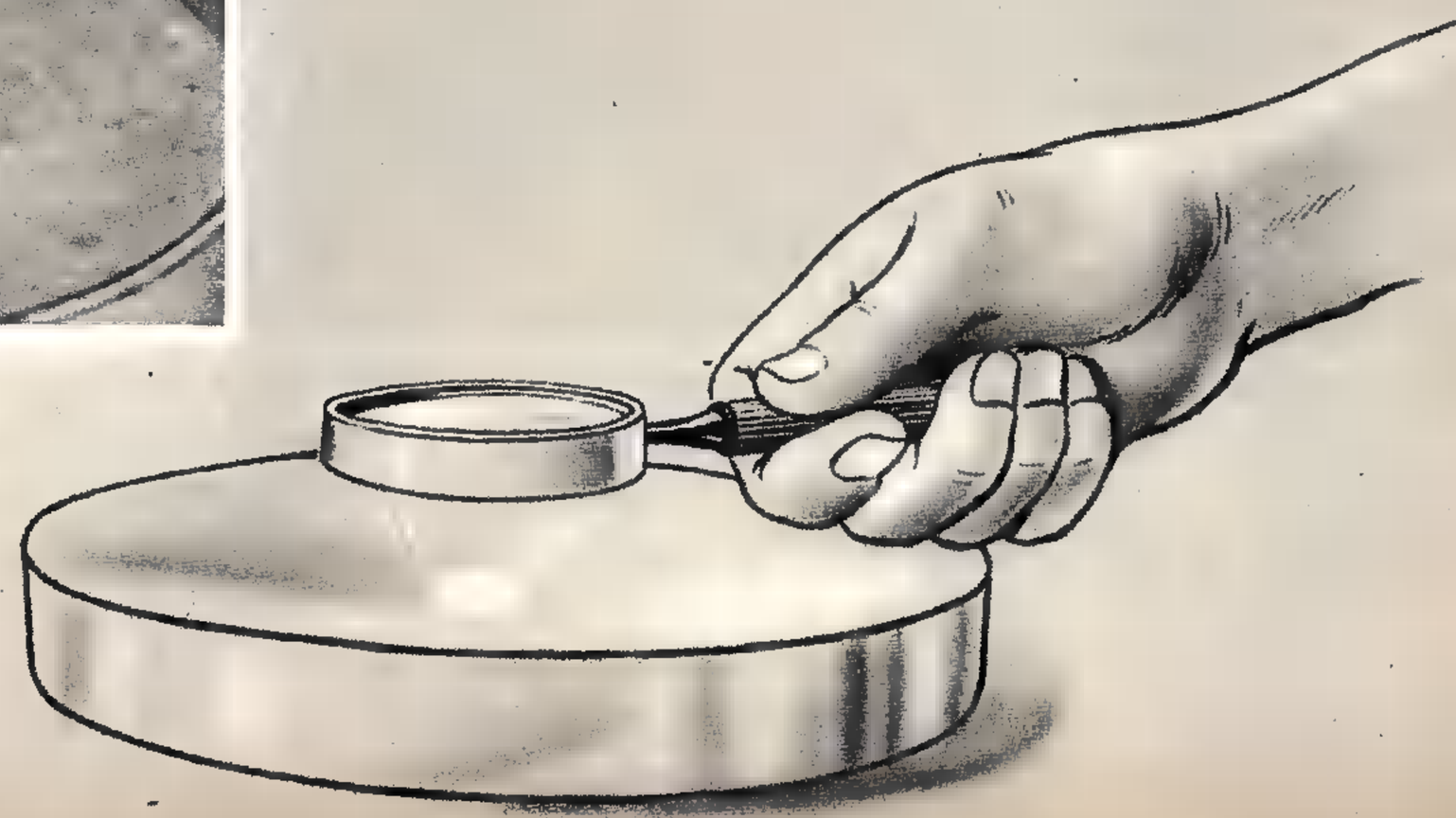


tion that is hard to beat. As to the equipment necessary, it is far less elaborate than is imagined by the average workman. Of course, each worker in the field has a great many special gadgets and pieces of equipment which he believes essential. In truth, they are essential only to his particular technique. One of the purposes of this series of articles is to strip telescope making to its true, and remarkably simple, essential.

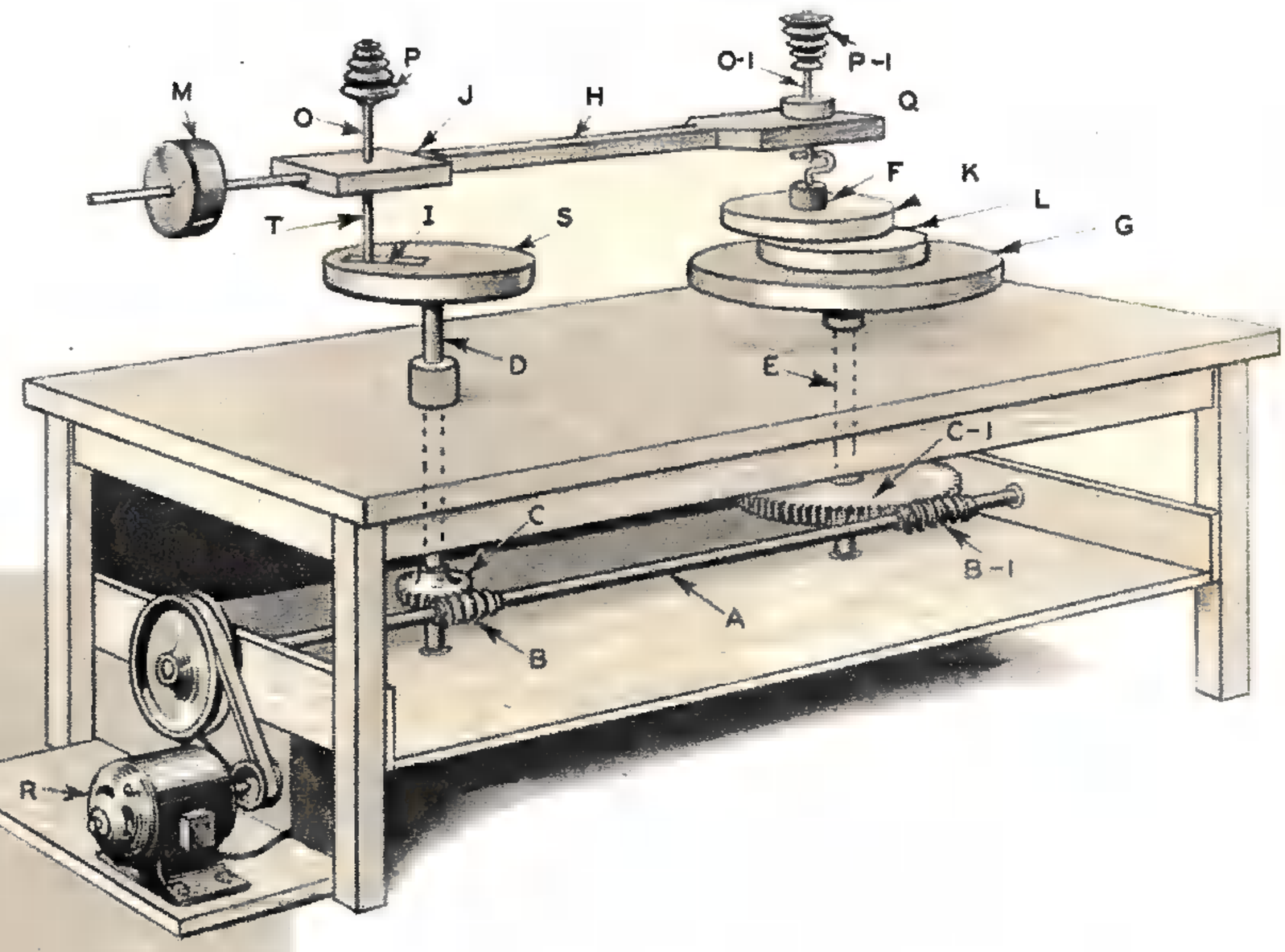
On the other hand, it is obviously impossible to cover the whole field of telescope making and optical calculations in articles of this length. The broad outlines will be sketched and the major steps described. For the rest, the worker will have to rely on his own good judgment and understanding of mechanics to get him over the minor difficulties which are bound to arise. The worker who wishes to study the subject in more detail is referred to the numerous books on the subject.

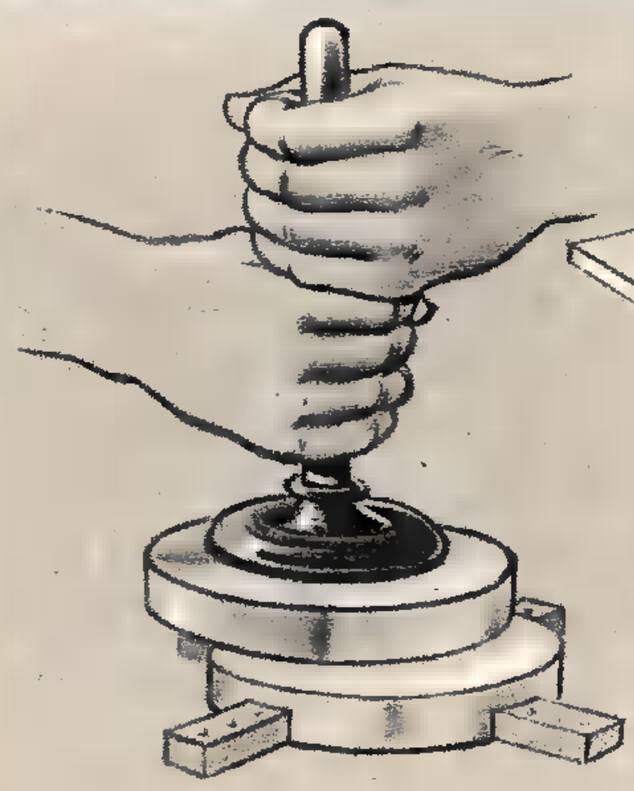
During the grinding, polishing and testing of a mirror, the simplest home workshop, so long as it has an assortment of common tools and a good, solid workbench, will be sufficient. The only truly essential thing is a good lock on the door, with the key reposing in the worker's pocket. Mirrors are very sensitive to heat, cold and shock. They do not make ideal playthings for Junior. The workshop must never be dusted while a mirror is in process of grinding. Particles of the rough grinding abrasive will

Left—Mirror being polished by hand. The table shown is set in a heavy movable base. However, a barrel is a good substitute for the table. For grinding, a glass "tool" is used instead of the pitch lap shown. Below—Examining the surface of the mirror for pits. A reading glass is used for this test. An out-of-focus sun spot reveals pits and scratches on surface of mirror.



A drawing of the mirror grinding machine. Power obtained from the electric motor is transmitted to the two turntables through the shaft A. Gears reduce the speed to sixty r.p.m. for the eccentric table S, and to two r.p.m. for the grinding table G. The slot I makes possible adjustment for the eccentric motion of the arm H. This arm is hinged at J to allow removal of the mirror K from the "tool" L. The belt for connecting the two pulleys is not shown. M is a counterbalance for adjustment of pressure of mirror against "tool."





Above — Diagram showing method of grinding mirror by hand. A "plumber's friend" is used as a handle for the mirror. A glass "tool" is under the mirror. Blocks of wood are used to hold the "tool" in place during grinding operation.

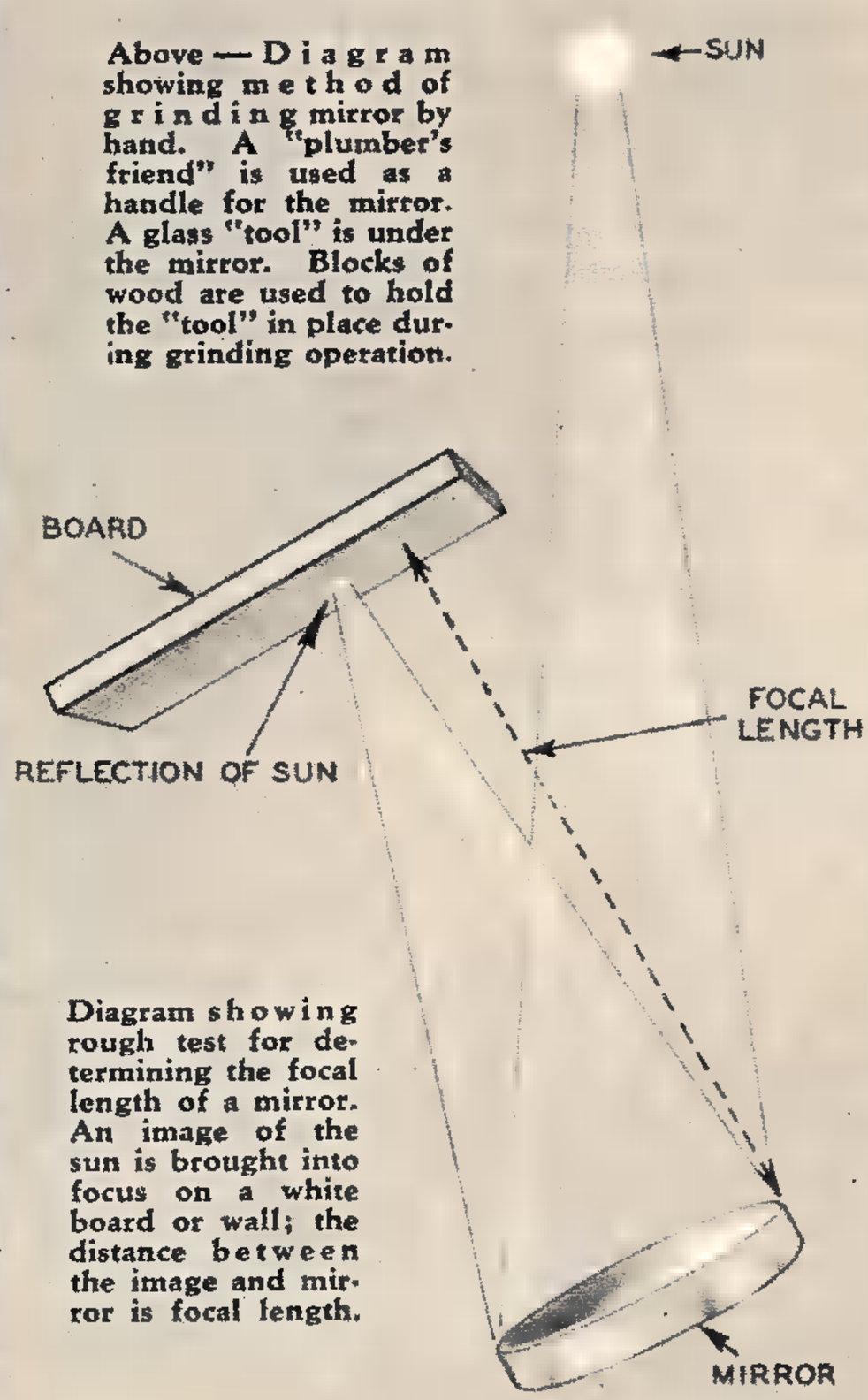


Diagram showing rough test for determining the focal length of a mirror. An image of the sun is brought into focus on a white board or wall; the distance between the image and mirror is focal length.

invariably get on the surface of the mirror and scratch it. Therefore, women with dusting apparatus must be relentlessly kept outside. The only known way to do this is with a lock.

If it is planned to place the mirror in one of the more elaborate metal mountings, certain power tools will be found necessary, or at least a great help. This however, will be discussed in the third of this series of articles, which deals with types of mountings.

There is one other necessary piece of equipment—a mechanical bent of mind on the part of the workman. This problem, however, usually solves itself, as anyone interested enough in telescope making to attempt it seriously is almost always at least a passable workman.

The following items and equipment are necessary to begin the grinding and polishing of a six-inch mirror. (A mirror of that size has been chosen for this discussion because it is simple to grind. If it is designed to have a speed of F. 11, it need not be made parabolic. However, mirrors from four to ten inches may be ground with only slight variations in the methods described in this series of articles.)

The items in this list are the bare minimum necessary to attempt to grind a mirror:

1. Two circular pieces of glass, six inches in diameter. One will form the mirror, and the other the tool. The glass which is to be made into the mirror should be Pyrex. Annealed glass will do, but Pyrex is far superior. The tool may be of ordinary glass. The mirror should not have a thickness of less than one-sixth of its diameter. The tool may be of lighter material.

2. If the mirror is to be ground by hand, a barrel or other circular stand will be necessary. The workman walks around this as he grinds.

3. One pound of pitch, or black asphaltum.

4. Carborundum in the following grades: No. 80, No. 220, FFF, No. 320, No. 600. Various workers prefer different grades, but the above is a good working average. Some M 303½ American optical emory will be found useful, as described later.

5. One pound of optical rouge.

The entire system of mirror grinding is based on a remarkably simple physical principle. If a disc is shoved, under pressure, across the surface of another disc of equal hardness, there being abrasive between the two, each stroke covering about one-third of the diameter of the lower disc, and if the upper disc is rotated in such a manner that the grinding is equal on all portions, the two discs will become spherical, the lower being convex and the upper concave.

As we are seeking to produce a concave mirror we may disregard the lower disc—which is known as the tool.

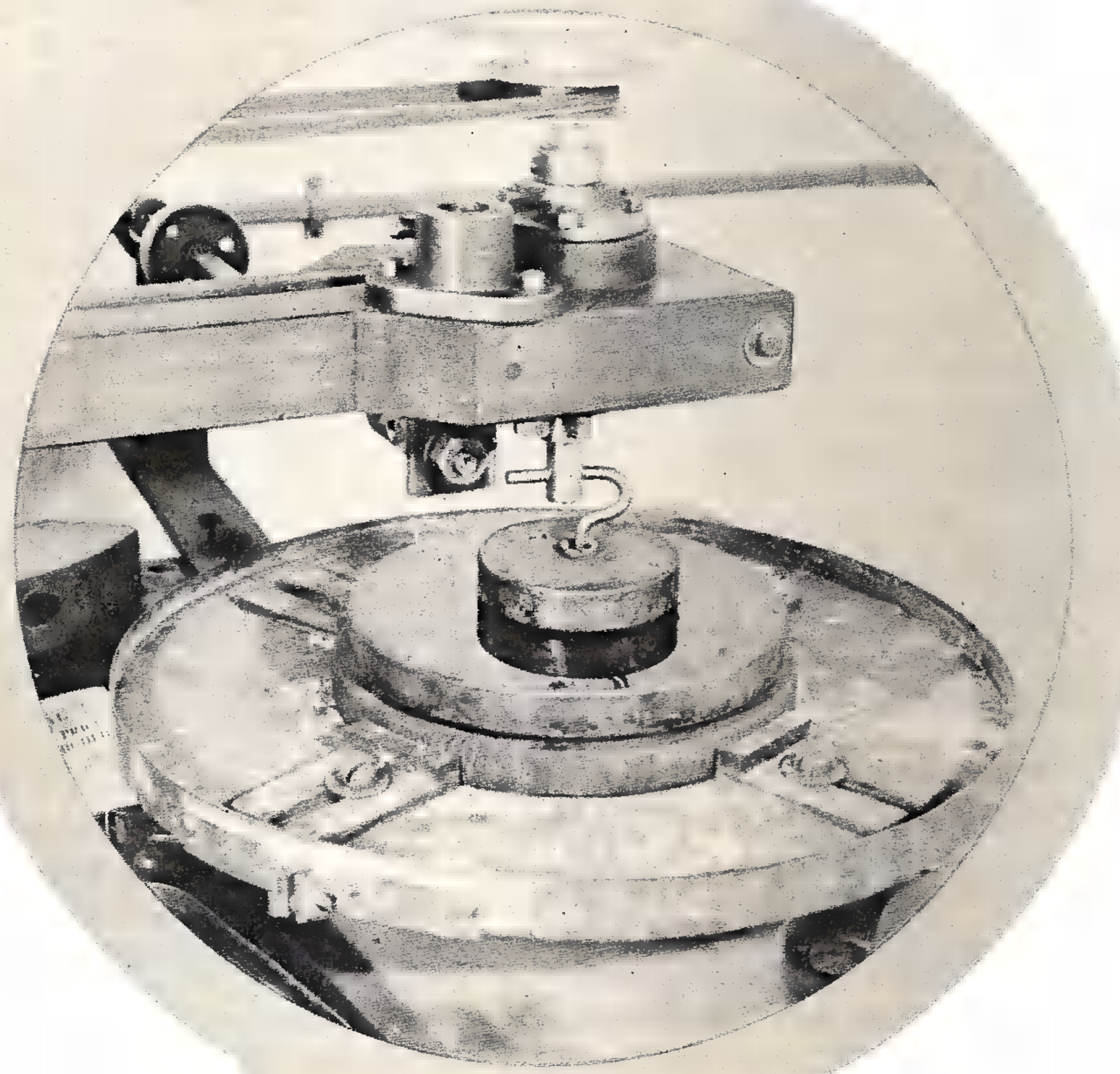
It is a good plan to make a template as a guide. This is done in the following manner:

Having decided on the focal length of your mirror fasten one end of a piece of strong cord to the floor and with a radius equal to twice the focal length of the mirror describe an arc slightly more than six inches in length.

Take a segment of this arc equal to the diameter of your mirror and cut a template of tin reproducing the curve of this segment. By placing the template against the the face of the mirror you can easily get a rough check on how close the glass is approaching the desired curve. This test is, however, too crude to be accurate beyond the rough grinding stage.

The simplest way to produce the desired grinding motion is to shove the disc by hand, at the same time walking around a barrel. Perhaps a dozen strokes are given in one position before the worker moves in his circular path. The mirror is also rotated slightly in the hands as the grinding is done.

The abrasive necessary for grinding is furnished by the carborundum, which is dampened and placed between the glass surfaces.



A closeup of the grinding table with mirror in position for grinding. Machine is set for spot grinding. Although mirror grinding by hand is both interesting and good exercise, after a time it tends to become monotonous and for this reason many telescope makers find it an advantage to own their own grinding machine. The grinding table shown, turns at two r.p.m. while the eccentric table turns at sixty r.p.m.

The greater the pressure applied, the more rapidly the work will progress. The coarsest grade of carborundum is used first, being followed in order by finer grades. The purpose of the first coarse abrasive is to rough out the general shape of the curve, which, in a six-inch, F. 11 mirror, will be about .05-inch in depth. The successive grades of abrasive bring the curve closer to the exact shape wanted, at the same time polishing the surface, and removing pits and irregularities. The final polishing is done with rouge.

Before beginning to grind a mirror, it is absolutely necessary to decide on the desired focal length. A length of [illegible] inches has been chosen, as this is very convenient. The focal length of a mirror is the distance between the surface of the mirror and the point where the image reflected by the mirror comes to a sharp focus. The "speed" of mirrors is numbered in the same way as the lenses of cameras and other optical apparatus. That is, the diameter of the mirror is divided by the focal length and the resultant ratios characterized by the letter "F." A six-inch mirror having a focal distance of sixty-six inches is therefore said to have a speed of F. 1:11, or merely F. 11.

Having decided on the focal length of the mirror, the progress of the work may be tested in the following manner:

Take the mirror out into the sunlight, drench the face with water, and set it up on its side so that it casts a reflection of the sun on some vertical white surface such as the wall of a house. Move the mirror back and forth until the image of the sun comes to the sharpest possible focus. The image should be about one-half-inch in diameter. Then measure the distance between the mirror and the image of the sun. This will be the present focal length of the mirror, and corrections can be made accordingly.

Don't expect the focus to be very exact during the early stages of grinding. Rough grinding should be stopped when the mirror comes within four or five inches of the desired focal length. At this stage it is better to have the focal length too long than too short.

Fine grinding continues through the various grades of carborundum. It is essential that each successive grade of abrasive remove the pits left by the previous grade.

The pits may be easily seen by the application of the following test:

Take an ordinary reading glass and place it between the mirror and the sun in such a way that an out-of-focus image of the sun falls on the surface of the mirror. This image should be about half an inch in diameter. If the surface of the mirror contains pits, it will appear frosted under the illumination of this concentrated sunlight. If all the pits left by the previous abrasive have been taken out, it will appear clear. By moving the disc of sunlight over the entire face of the mirror, it is possible to make a good check for pits.

The testing of the focal length should be continued throughout the fine grinding stage. As the mirror comes closer to the desired focal length, the testing will become simpler and more accurate.

Great care should be exercised in cleaning the mirror with water whenever making [illegible] change in the number of abrasive. A single grain of the coarser grade of carborundum will scratch the mirror and make necessary a return to coarser grinding.

The worker should "feel out" the mirror as he grinds. When the feel tells him that the carborundum is no longer cutting, fresh abrasive should be substituted before the work is continued.

Although mirror grinding by hand is both interesting and good exercise, it does tend to become monotonous. This is especially true when the worker begins on his second or third mirror. For this reason, many workers find it an advantage in the long run to construct a grinding machine.

The base of the machine shown in the accompanying diagram, Fig. 1, is a sturdy wooden bench. The shaft A runs in two bearings fitted into either end of the bench. This shaft has two worm gears, B and B′, which mesh with the two large gears, C and C′, These in turn drive the shafts D and E. The gearing should be so arranged that the speed of the table G is [illegible] r.p.m. that of the table S 60 r.p.m. A system of belts and pulleys may be substituted for the worm gears.

The long arm H is pivoted on the eccentric T. This provides a sliding motion of the mirror K over the tool L. The arm H is hinged at J to allow the mirror to be lifted from the tool. M is a counterbalance and should be so weighted that there will be a light pressure between the mirror and the tool. An old coffee box filled with lead will do for a weight. It can be slid along the rod until the proper balance is achieved.

The shaft O′ runs through a bearing at Q. It should be allowed to rotate freely. In this way the mirror will be turned slowly by friction in the opposite direction from the tool.

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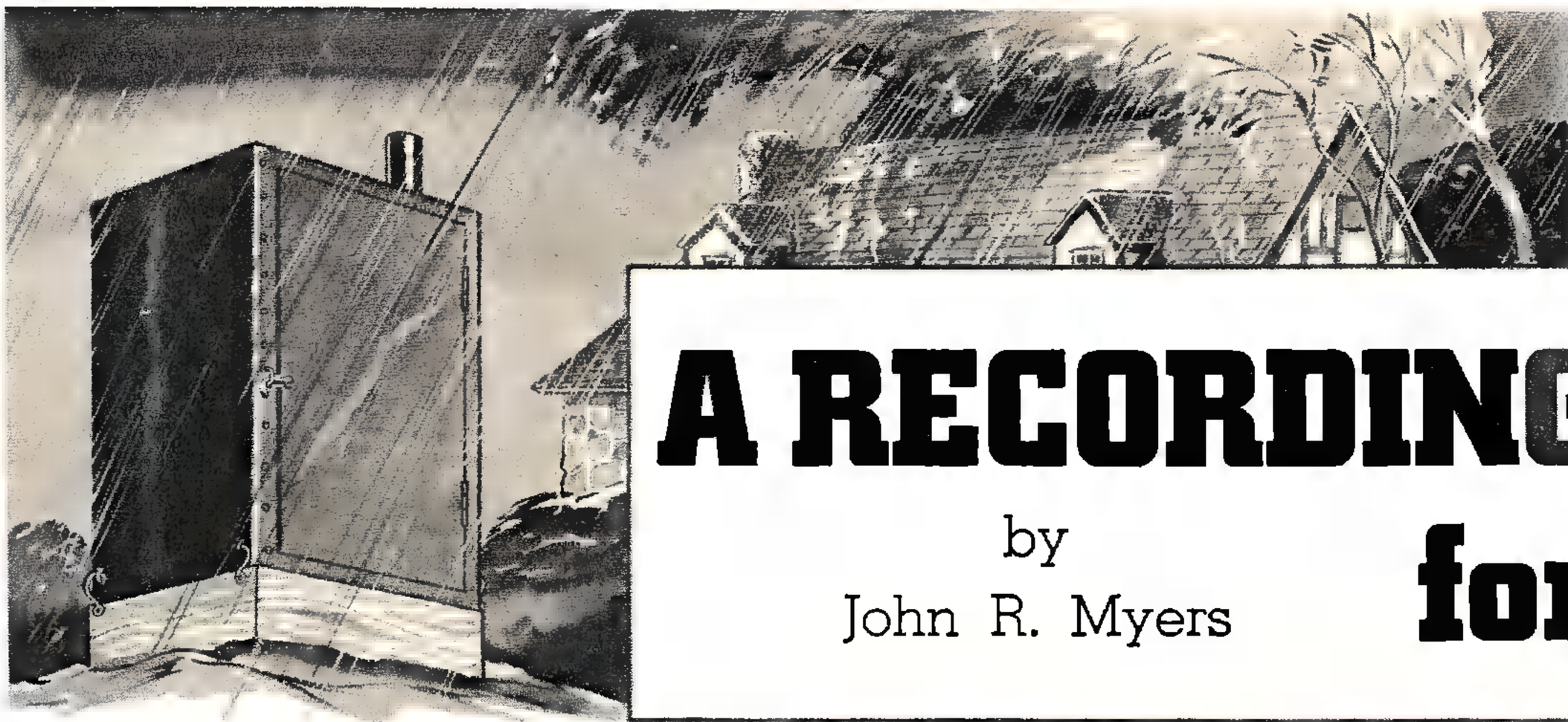


A RECORDING for

by

John R. Myers

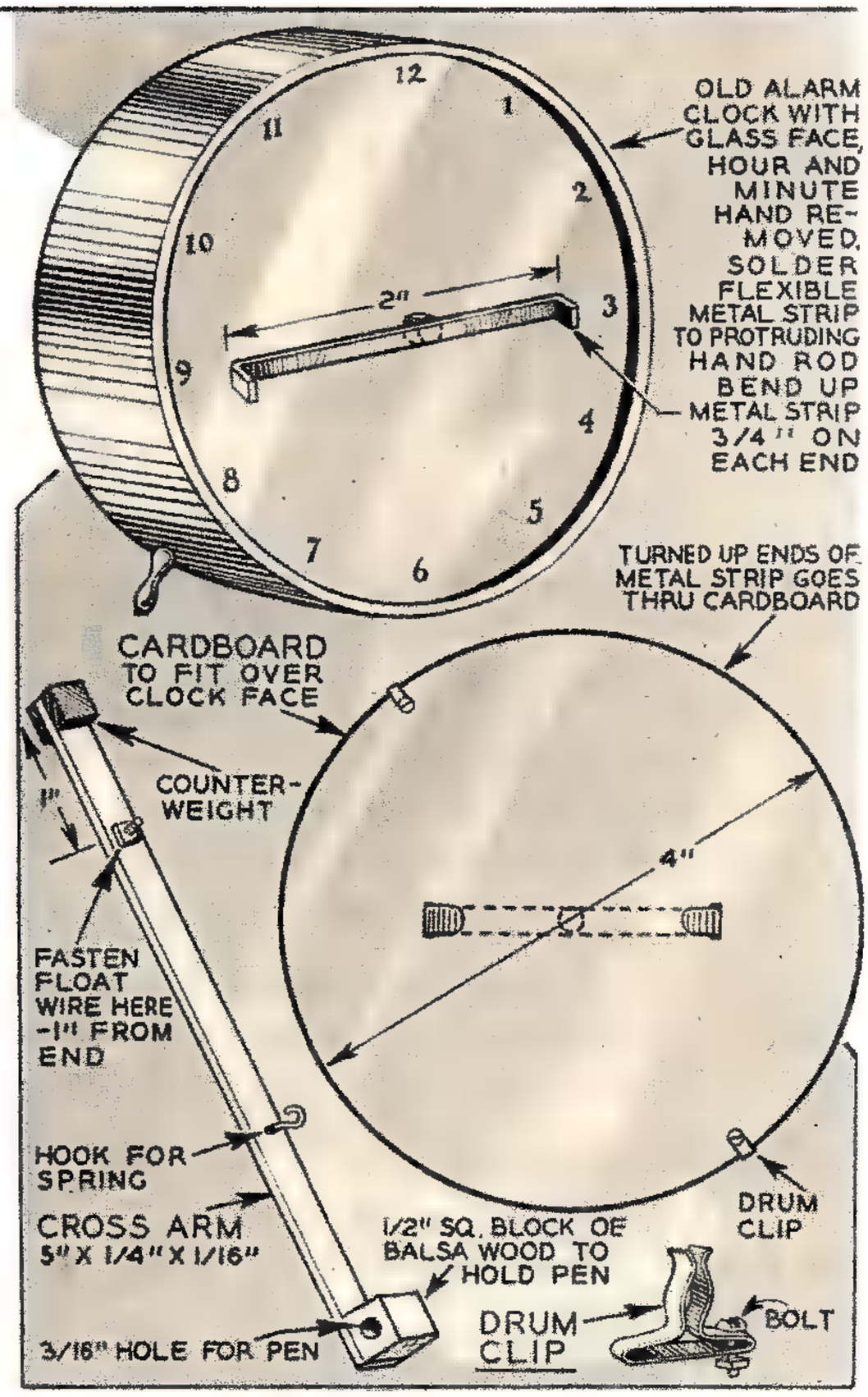
THERE are few subjects, if any, that create more general interest than the weather. If you are like the average American, the first item you read, when you pick up the evening paper, is the general forecast of weather conditions. The study of the weather in all of its many phases provides an interesting hobby that can be pursued by any man or boy.

A recording rain gauge is only one of the many homemade weather instruments that will find practical application in the amateur meteorologist's observatory, but the building of this interesting device will definitely prove the merits of this hobby and spur you on in making other forecasting instruments. The rain gauge, about to be described, not only indicates, graphically, the exact amount of fall, but shows, directly on the graph cylinder, when the rain began and when it ended. Though its accuracy is comparable with the most costly of laboratory instruments, this recording gauge can be built for less than two dollars.

Procure, first, a one dollar alarm clock, with a three-inch diameter face, to be used for rotating the recording drum. Remove the glass face and also the hour and minute hands, then to the minute hand rod, solder a strip of metal about 3½ inches long with the ends bent up about ¾ inch at both ends, at right angles to the face of the clock.

Cut a disc from stiff cardboard 4 inches in diameter and to it fasten two right angle clips of ¼-inch flexible steel. They should be placed opposite each other, 3¾ inches apart and fastened to the cardboard with small bolts. The clips serve to hold the recording drum on the face of the clock.

Punch two holes in the cardboard disc for



The rainfall for a given period is recorded on a cylinder to which is fastened a graph paper chart. An alarm clock, from which the face and hands have been removed, is fitted with a metal strip, soldered to the hour hand, to permit attachment of the chart drum, as shown above. Details of pen holder, drum clip and disc for supporting the chart drum are also indicated.

the upturned ends of the strip soldered to the clock shaft. The cardboard disc is next set in place with the two metal ends protruding from the slots provided for them after which the two metal upright strips are

Operated by an alarm clock mechanism, this recording rain gauge provides the amateur meteorologist with a very accurate weather station instrument.

RAIN GAUGE amateur weathermen

clinched to hold the disc in permanent position.

For the recording drum, get a cardboard carton that is exactly 12 inches in circumference. An empty salt container works very satisfactorily. The two right angle drum clips will hold a drum of this size in perfect position by cutting the bottom out of the drum so the

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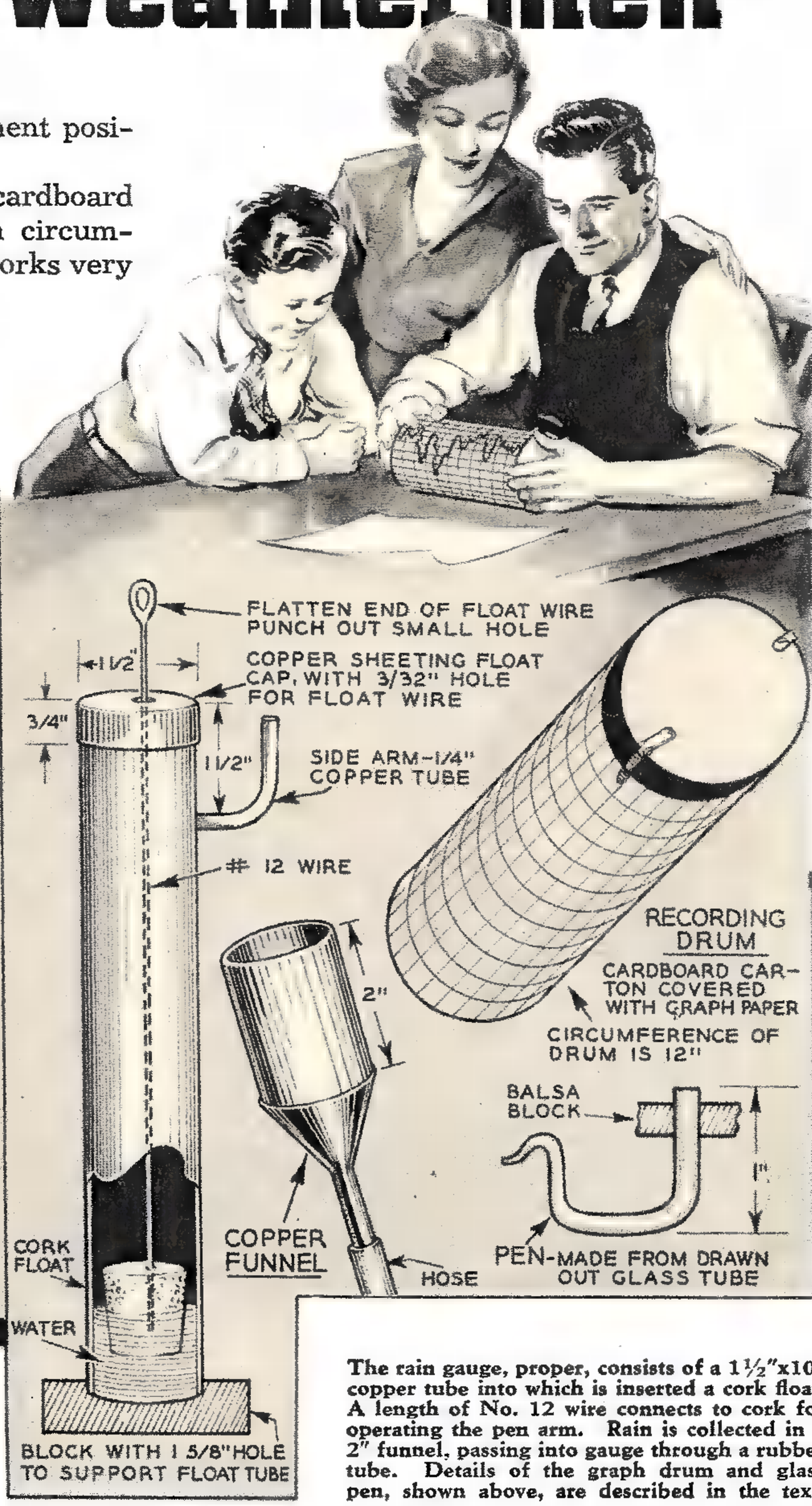

The rain gauge, as it appears when completed, is depicted here. When in use, the device is protected in a 9"x9"x20" oil cloth covered box. Mount the recording drum on a support of sufficient height so glass pen contacts chart.

The rain gauge, proper, consists of a 1½"x10" copper tube into which is inserted a cork float. A length of No. 12 wire connects to cork for operating the pen arm. Rain is collected in a 2" funnel, passing into gauge through a rubber tube. Details of the graph drum and glass pen, shown above, are described in the text.

Build A Bellanca "Gas" Model Plane

by Fred C. Tuxworth

CONCLUSION

THE wing is constructed along conventional lines. (Study the plans). Much time can be saved in rib-making if thirty-two pieces 10¼″ x 1⅝″ are cut from $\frac{3}{32}$″ hard sheet balsa and pinned together in two or three blanks. The rib pattern is marked off on both sides of each blank and cut with jig or bandsaw roughly to shape. The cutaway portions and the spar slot are cut with a jig saw. Use the coarse sanding block for finishing.

The leading and trailing edges may now be cut and shaped and the wing assembled. Glue all joints securely, utilizing all possible area. Brace the frame with linen thread the same as the fuselage. The tip ribs are formed by running ⅛″ sq. strips over formers, and the root rib is $\frac{3}{16}$″ balsa curved to fit the fuselage. The sheer pin tubes, one inch sections of ¼″ diameter aluminum tubing, are glued and lashed into position, and the two inside ribs are covered with $\frac{1}{32}$″ balsa. The basswood blocks for strut fittings are pinned and glued in place. The leading edge former ribs are $\frac{3}{32}$″ x $\frac{5}{16}$″ soft balsa and are sanded to shape after they are placed and glued. Ailerons are optional, but advisable, and may be hinged with soft iron wire.

Details of wing construction, rigging and assembly appear in this final installment.

The stabilizer is built like the wings. The rear spar is replaced by a piece of ⅛″ diameter drill rod at the center to fit into a tube for the stabilizer hinge. The fin ribs are ⅛″ square strips bent around the fin spars.

The hinges and fittings for the tail surfaces are clearly shown in the drawings. Both adjustment screws are made from ⅛″ diameter brass brazing rod, threaded with a 6-32 die and slotted for a screw-driver. Fittings for the tail surface brace wires are bent as shown from .020 piano wire. The brace wires between the fin and stabilizer have hooks bent in each end so they can be removed. Those between the stabilizer and the bottom of the fuselage are equipped with turnbuckles to keep the whole assembly taut.

Rigging the wings is the next step. This is an important operation and must be done carefully. The center section spars are $\frac{5}{16}$″ square balsa with sheer pin tubes lashed on either end as in the wing. Place them in their approximate positions in the fuselage and slip the wings in place, using white pine dowels for sheer pins. The spars are not glued till after the wing is properly aligned. Set it at

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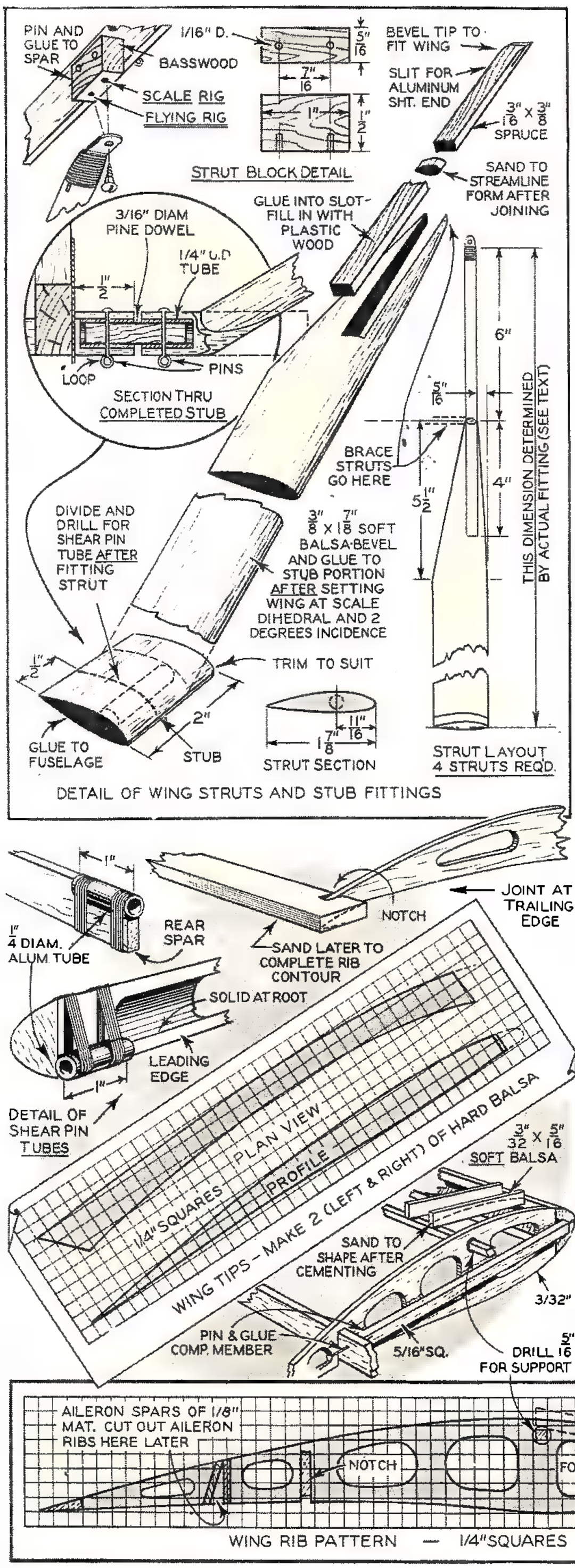
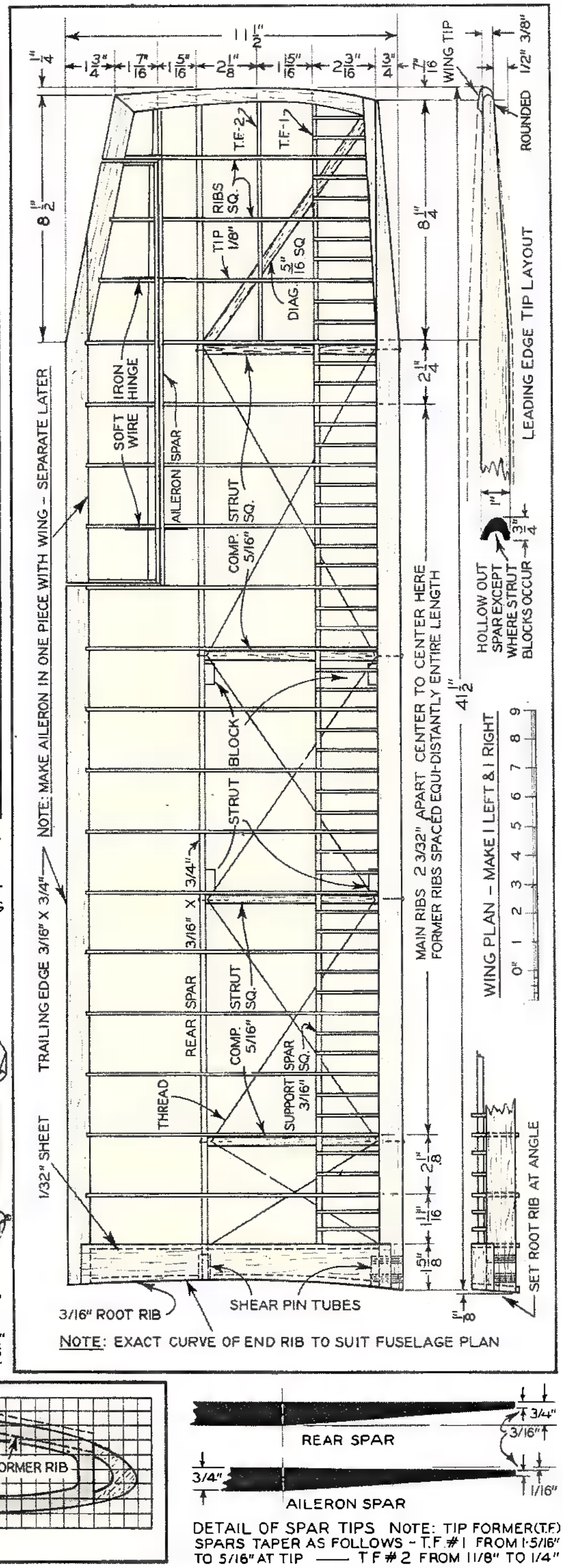
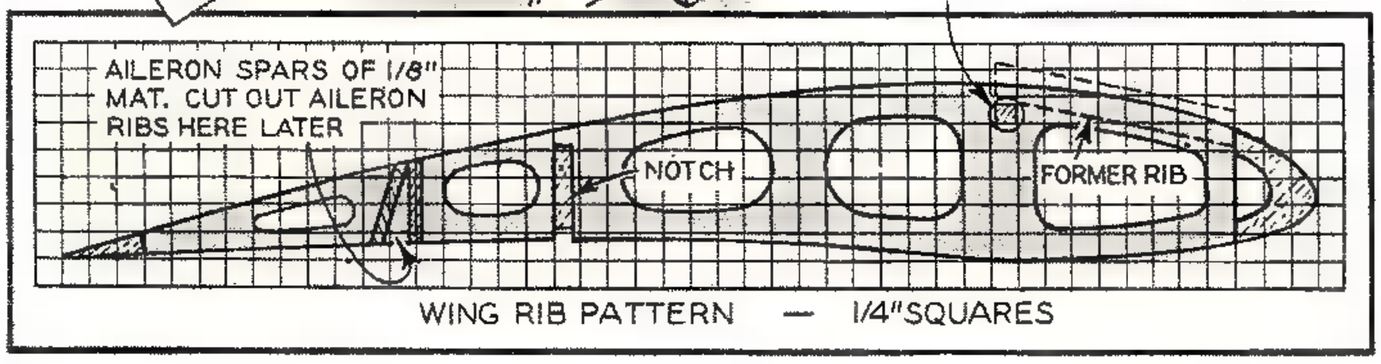






DETAIL OF SPAR TIPS NOTE: TIP FORMER (T.F.) SPARS TAPER AS FOLLOWS - T.F. #1 FROM 1-5/16" TO 5/16" AT TIP —— T.F. #2 FROM 1 1/8" TO 1/4"

The wing of the Bellanca "gas" model is constructed along conventional lines, but a careful study of the above plan should be made before actual construction is started. Note that some parts are made of hard balsa while others use the soft grade. Time can be saved in making the ribs by cutting one to the shape indicated on the rib pattern and then pinning five or six balsa blanks together, using the carved rib as a pattern for trimming the blanks to shape. After shaping, the ribs are notched out with a jig saw to provide the spar slots and to reduce weight of the completed wing.

two degrees positive incidence with the thrust line, and be certain it is the same in both wings. The dihedral in flying position is 6″ and scale position 3″. This can be varied by changing the strut positions from the inside to the outside holes of the strut fitting blocks. Measure the distance between the tail post and each wing tip to check alignment.

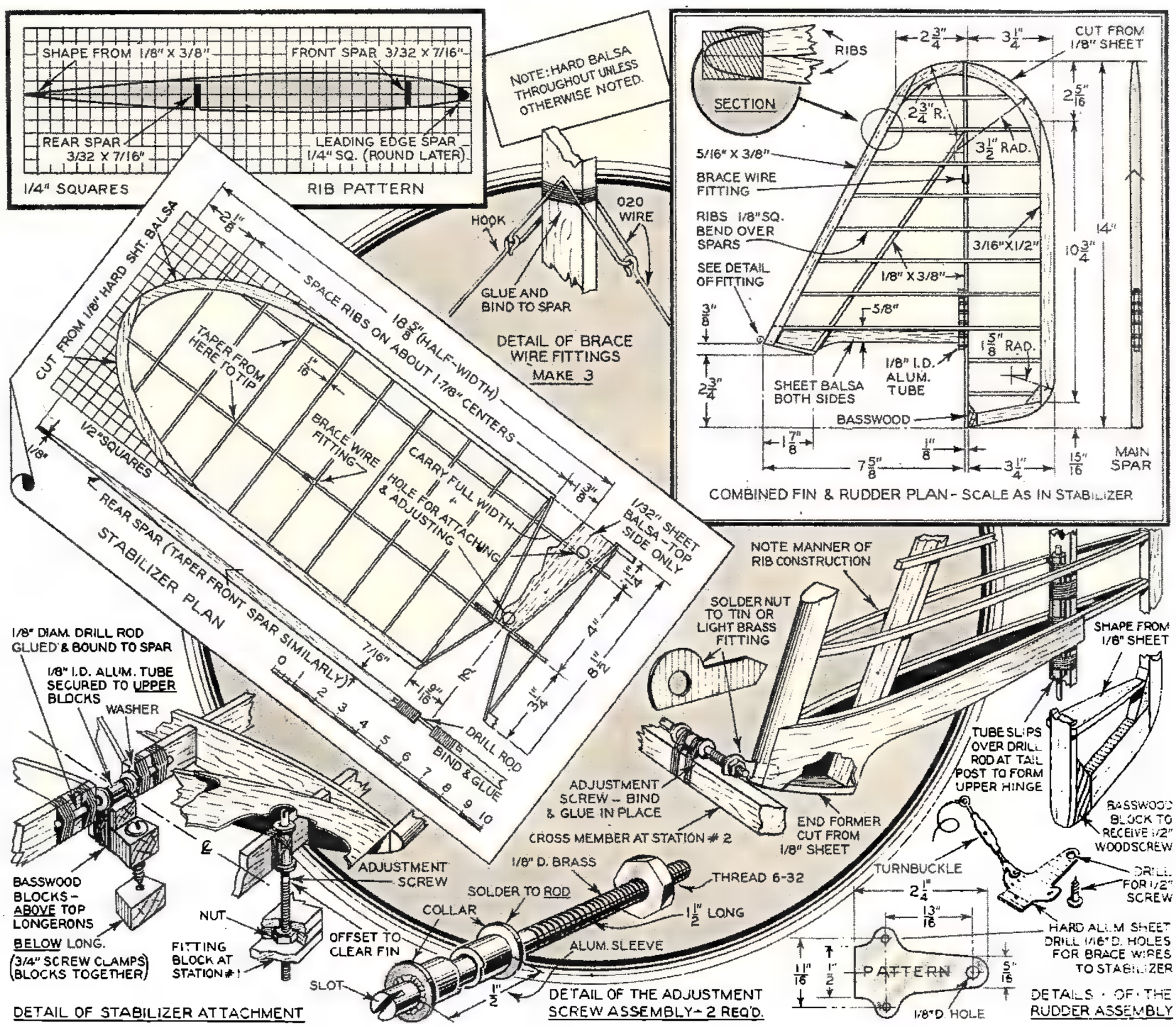
After the plane is finished the sheer pin tubes receive white pine sheer pins. In case of a severe impact the pins will break before the wing. Replace them and the plane is ready for another flight.

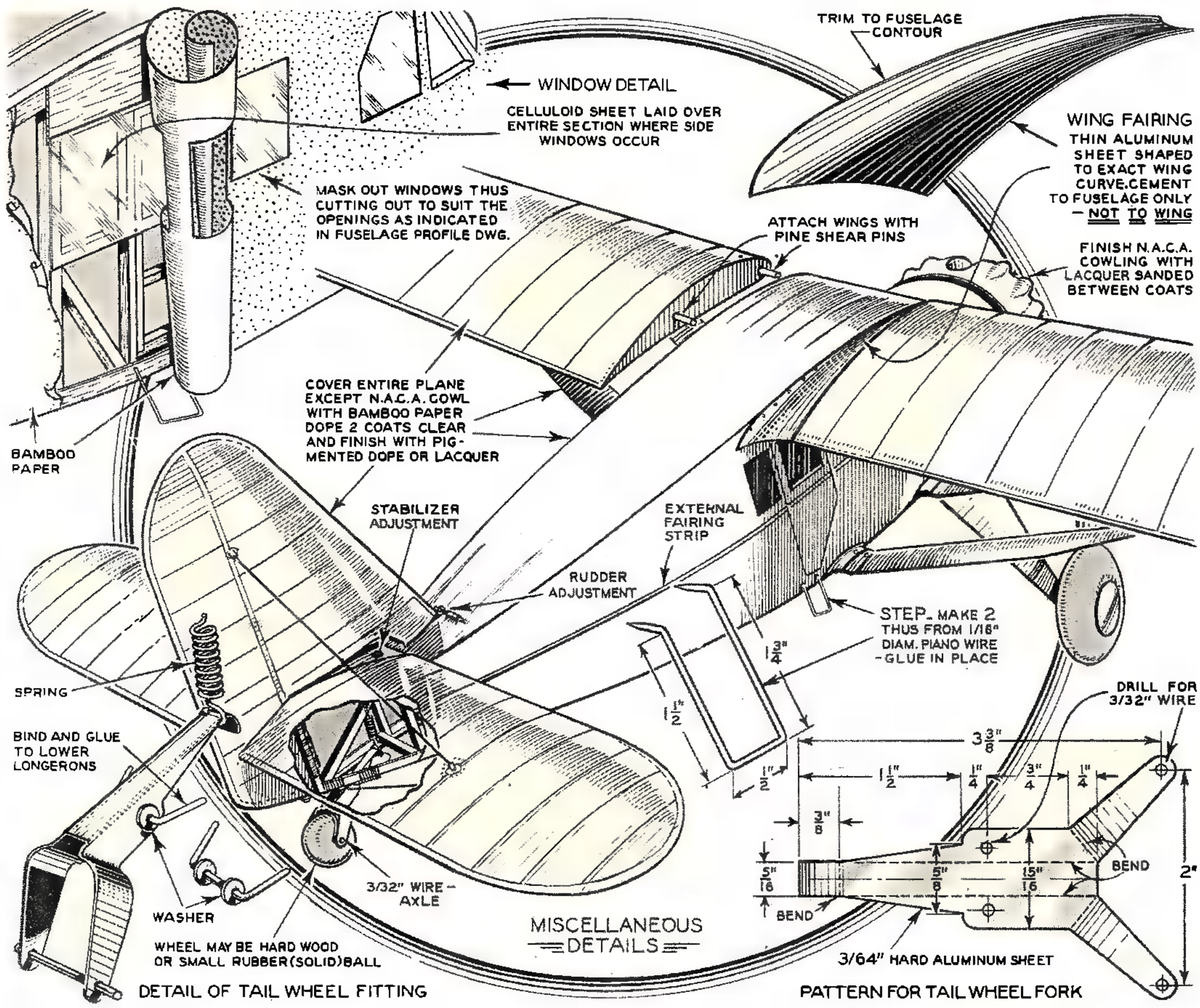
The struts are made according to the drawing from soft balsa and spruce. Two-inch sections of the struts are glued to the lower longeron so that they jut straight out as on the real Bellanca. The wing is then set on scale dihedral by resting the tips on blocks. The struts are cut to the correct length by fitting, and beveled to fit the stubs. Then they are fastened to the outside holes of the blocks in the wings and glued securely to the stubs. The short bracing struts can then be bound and glued in place.

When the struts are dry they are cut off one-half inch from the fuselage. Drill them and place in the sheer pin tubes. Use straight pins to secure the sheer pins in position.

You are now ready to cover and finish your model. First see that all holes and unsightly joints are smoothed over with crack filler. The celluloid for the windows should be put in place and the windows outlined in the covering material. Added realism may be obtained by adding a thin sheet aluminum wing fillet, air speed indicator, and a venturi tube. Cover with bamboo paper using airplane dope or any standard commercial product for an adhesive. All wood parts excepting the N. A. C. A. cowling should also be covered to provide a better surface for the finish. The N. A. C. A. is given several coats of lacquer surfacer and sanded. This will

Construction of the Bellanca's tail surfaces and method of regulating the incidence of the stabilizer are shown in the plan and detailed sketches below.





Details of the final assembly job are shown above. Wing fairing is cemented to fuselage only so that in the event of a bad landing the wing can fall free after the shear pins break.

give it a smooth metallic appearance.

Apply two coats of dope to the covering and use very fine sandpaper to remove any noticeable fuzz.

Lacquer or pigmented airplane dope is used for finishing. Although the color scheme is entirely optional, it is suggested that elaborate arrangements employing scallops and curved lines be avoided. They may conflict with the beautiful, conservative lines of the ship, making it appear gaudy.

All that now remains is to provide for ignition. The coil and the condenser are held on the plywood gusset between the landing gear legs with narrow metal straps. The batteries are encased in a tube of fiber and fastened with rubber bands to the battery slide. They can be moved fore and aft to shift the center of gravity. The battery slide is removable, being held in place by aluminum clips which fasten to the lower cross members, and is secured by a wood screw. The propeller is, of course, dependent upon the make of engine used. Any of the companies manufacturing engines will gladly furnish you with a propeller design for their engines. If, however, you use a homemade engine, you will be forced to design your own.

For easy starting a booster of two or three dry cells is advisable. To employ this, bare about one inch of each of your battery leads. Bend them double at this bare spot and twist them into rigid prongs. Press these prongs through the veneer just in front of either of the doors and glue them securely. Better yet—use an ordinary phone jack. To "cut in" the booster, an assistant, (and they'll be plentiful!) can press the positive and negative booster wires to their respective battery leads and hold them till the engine is running satisfactorily.

Pick a windless evening or dawn and a fairly large, smooth field for your test hops. Glide the ship for balance by pushing it off the ground a little way. Adjust the batteries till it settles gently to the ground when the stabilizer is set at zero degree incidence to the

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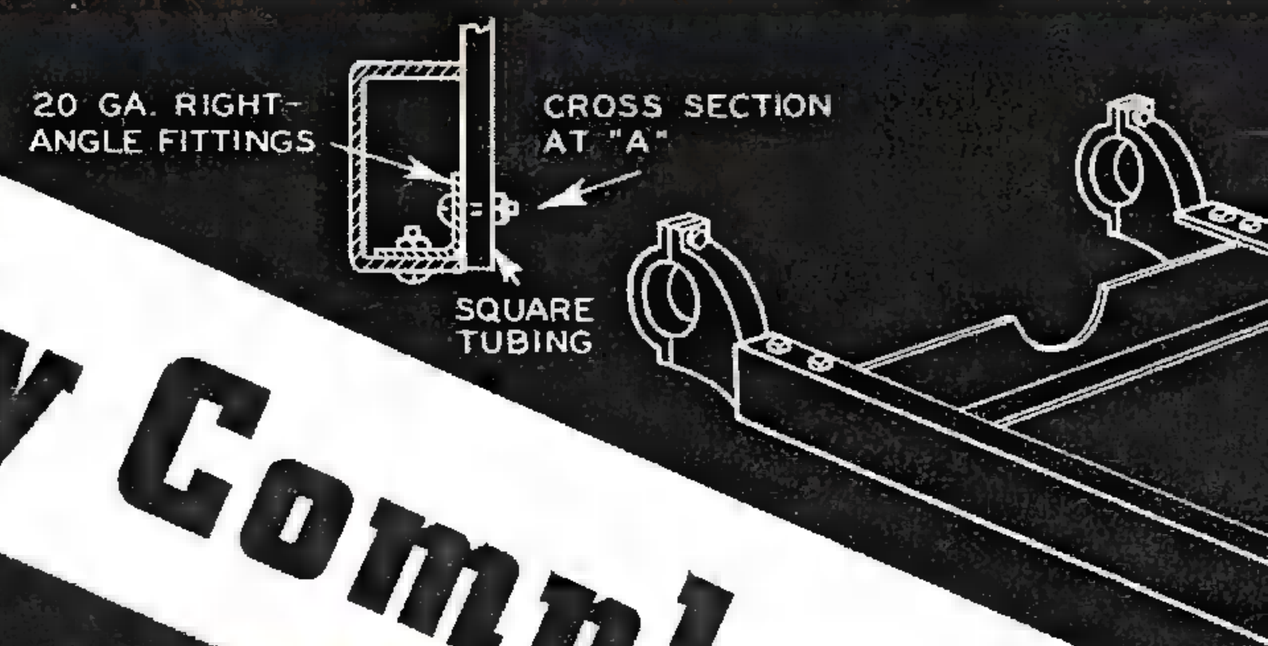
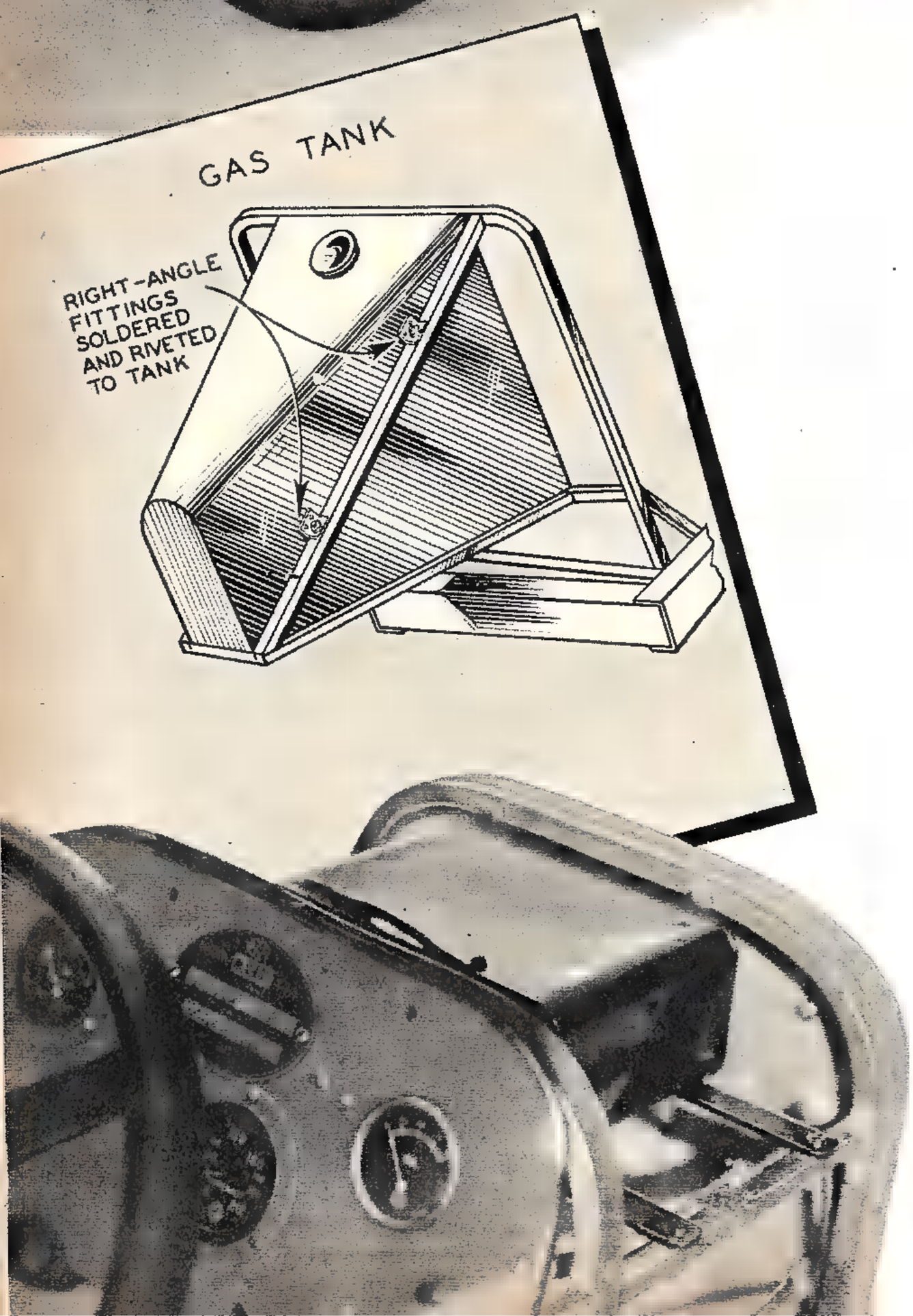
Body Completes

With the chassis constructed as described in previous installments, the racing fan is now ready to build the special body.



Although it has the aspects of the finest full-size racing car, "Arlen Special", shown here with Don Arlen, is constructed entirely from parts of junked autos.

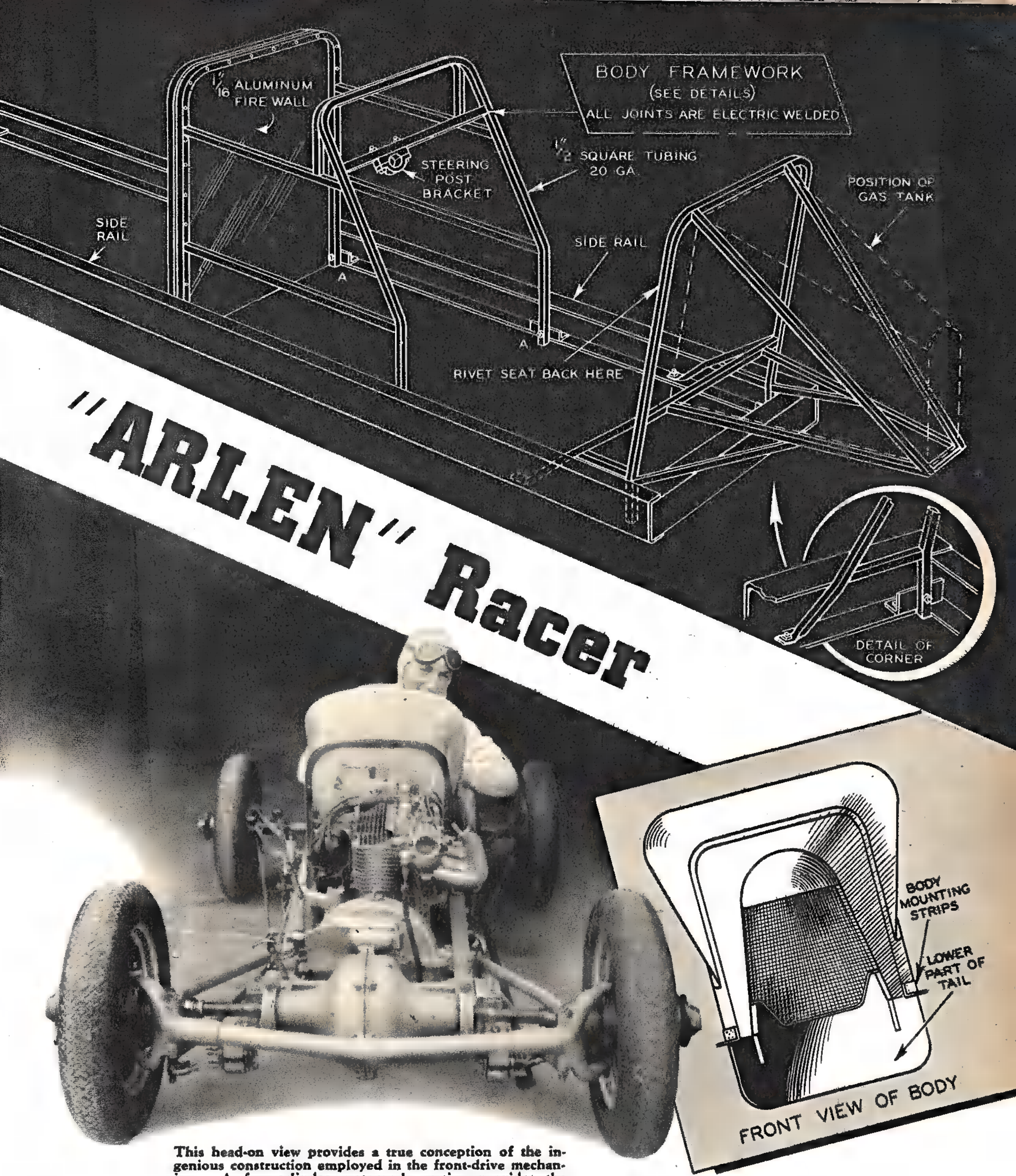


by Manley Mills

PART III

THE phenomenal success, during the past few years, of midget automobile racing has prompted hundreds of home mechanics and craftsmen to undertake the building of midget cars from whatever odds and ends they could salvage from old automobiles. Realizing that the popularity of the miniature racing car was steadily increasing, a leading West Coast racing car designer, Don Arlen of Hollywood, set to work on designing a truly authentic midget racer that could be constructed from materials procurable at any auto graveyard. The resulting car proved to be a masterpiece in custom racing car design, since it not only had been assembled from motorcycle and automobile parts, but featured a front-drive transmission—a feature usually found only on custom-built racers costing

Left—The gasoline tank is constructed from galvanized iron and shaped to fit in the tail of the "Arlen" body. Tank is installed in a rack formed from ½" sq., 20-gauge steel tubing. Below this is shown completed instruments panel and cowl framework construction.

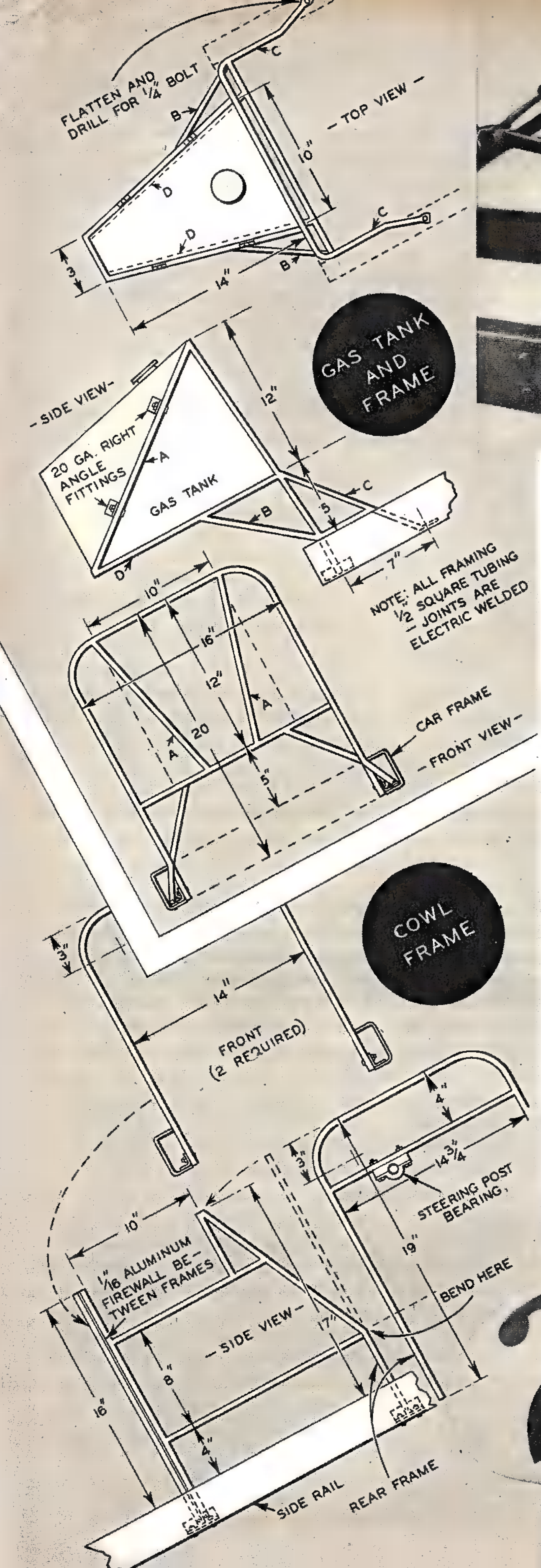


"ARLEN" Racer

This head-on view provides a true conception of the ingenious construction employed in the front-drive mechanism. A four-cylinder motorcycle engine provides the motive power to the converted Ford A transmission. Body frame construction is shown in upper diagrams.

$2,000 or more. Probably the most amazing fact concerning Don Arlen's racer was the cost. After all work had been finished and the car was ready for its first run, a check-up on expenses showed that the total investment was less than $100, or about one-twentieth the price of a factory built car!

In the foregoing installments, which appeared in the June and July issues of MODERN MECHANIX, construction of the chassis, axle, steering and front-drive mechanisms for the "Arlen Special" were discussed in detail. The builder has now reached the point where he is ready for making the racing body.



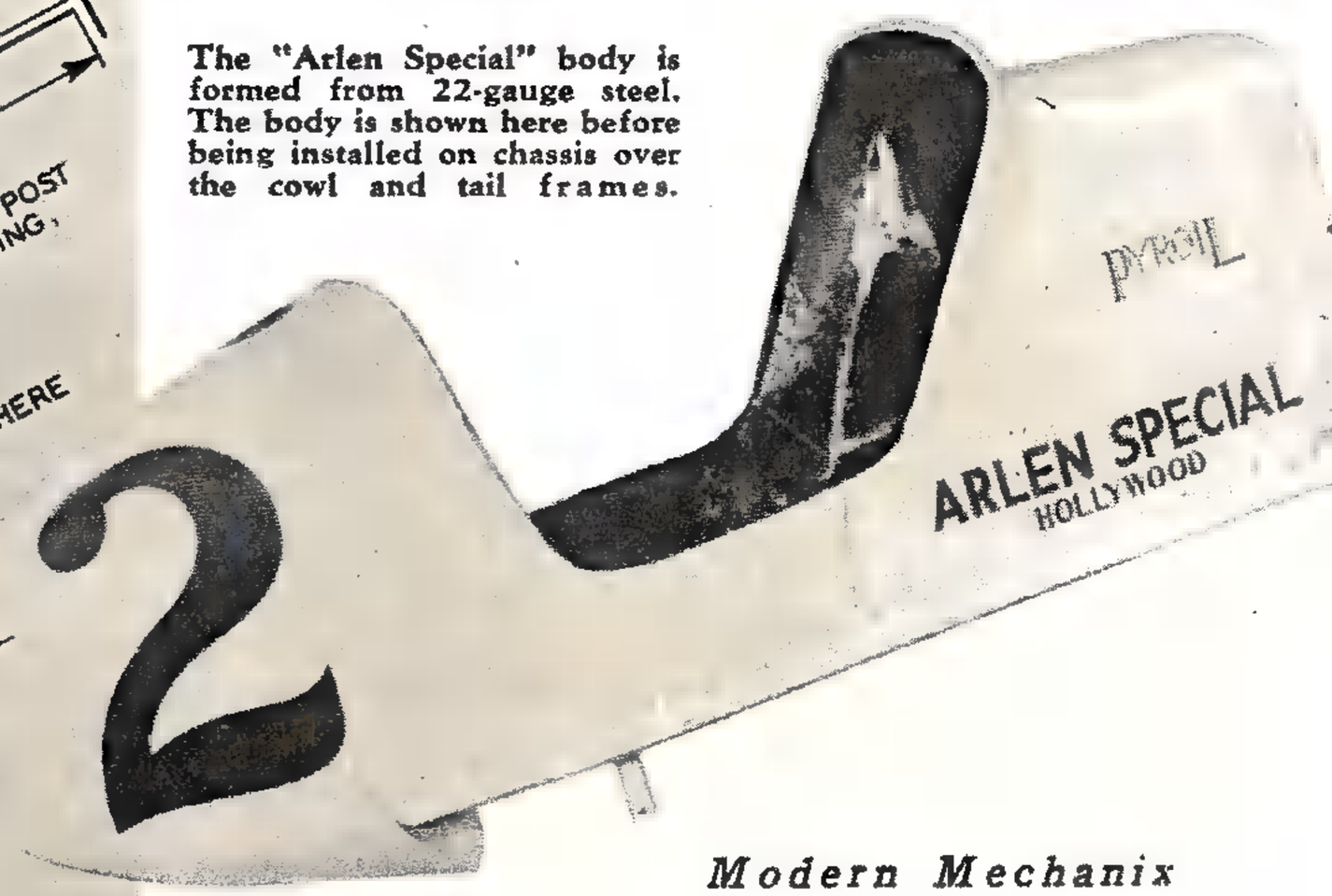
Detail of the cowl and gas tank frame construction is described in the schematic plans at left. Frames are formed from ½" sq., 20-gauge steel tubing and all joints securely welded. Above—Completed cowl.

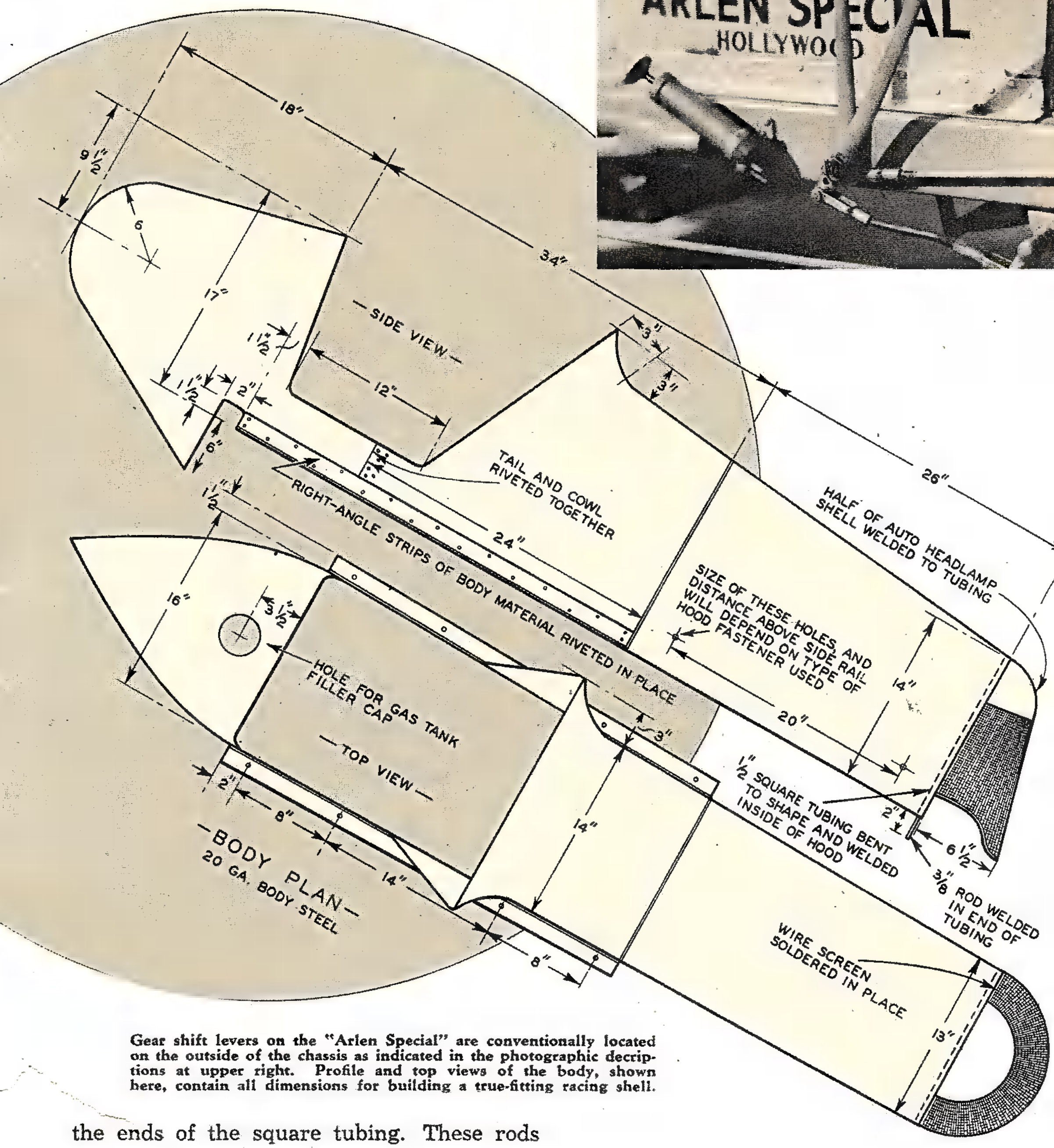
The cowl, tail, and hood are made from 22-gauge body steel. You can easily make the hood and cowl—and possibly the tail. However, you can have them made at any sheet metal shop for a nominal sum.

It's much easier to build the cowl without the 3" flare, but it adds so much to the appearance of the car that it is well worth including. The tail and cowl are riveted together, then the right-angle strips, made from body material, are riveted along the bottom edge on each side. These strips will rest on the side rails where they are bolted with ¼" bolts.

Hood and radiator shell are made in one. The pointed nose is made from half of an auto headlight shell. Bend a length of ½" square tubing to fit inside the front end of the hood where it is welded. Also weld the nose to the tubing. Ordinary screen wire is used to form the front end. A piece of ⅜" rod, extending down about 2", is welded into

The "Arlen Special" body is formed from 22-gauge steel. The body is shown here before being installed on chassis over the cowl and tail frames.





Gear shift levers on the "Arlen Special" are conventionally located on the outside of the chassis as indicated in the photographic decriptions at upper right. Profile and top views of the body, shown here, contain all dimensions for building a true-fitting racing shell.

the ends of the square tubing. These rods slip into short pieces of round tubing, welded to the inside front ends of the side rails. Ordinary auto type hood fasteners hold down the hood. The rear end of the latter and the front end of the cowl rest on hood lacing, riveted to the front part of the cowl frame.

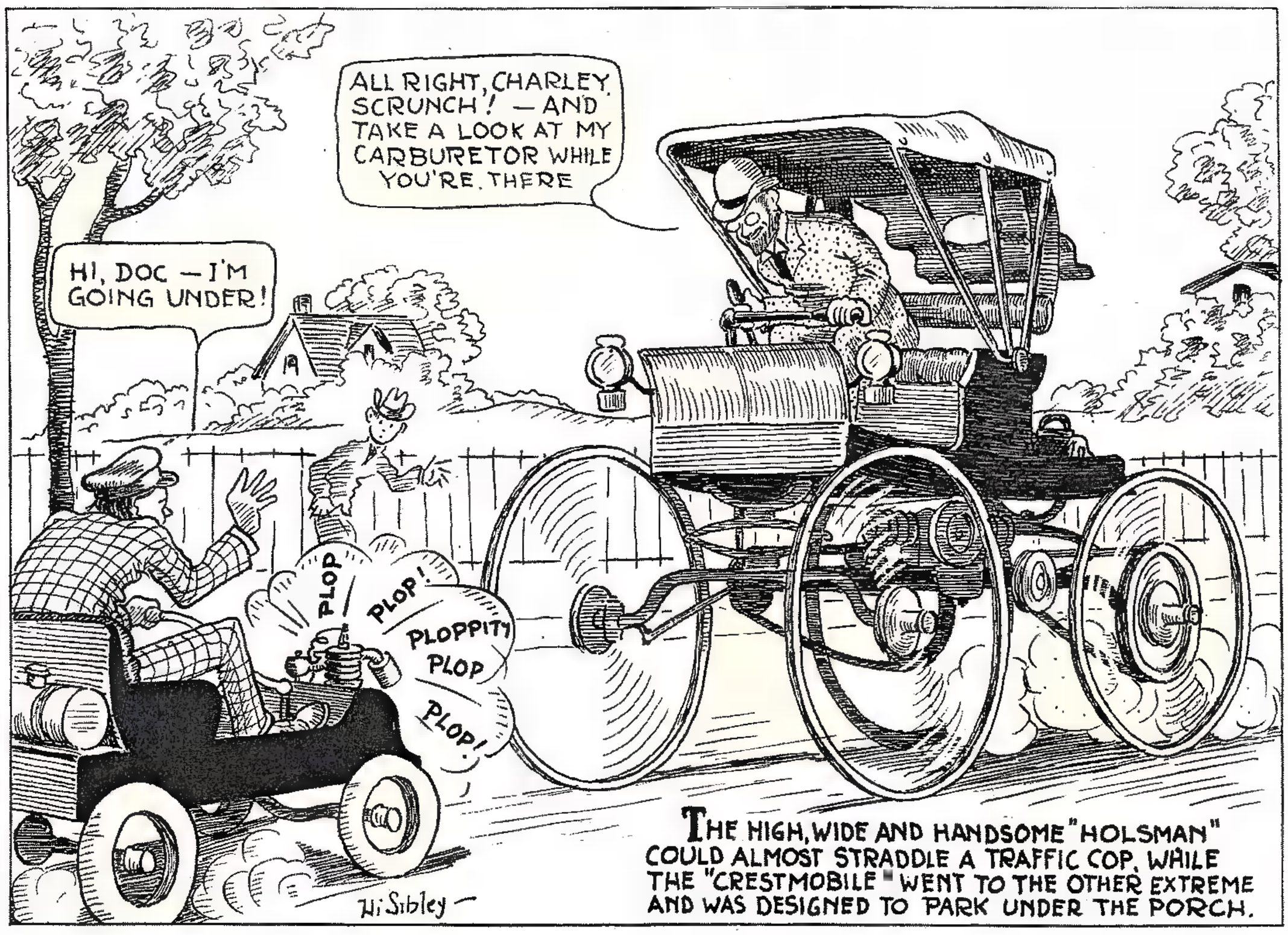
A snappy paint job will add greatly to the attractiveness of the car. The color scheme is, naturally, optional with the builder, but as a suggestion a chrome yellow body and chassis, with red wheels, trimming and lettering, is a good contrasting job.

Anyone with average driving ability can easily handle this car up to about 65 miles per hour, without any previous practice. However, beyond 65 miles per hour conditions change rapidly and it is then when you must exercise skill and caution so as to keep the car rolling on all four wheels.

Numerous tests runs have been made on the Legion-Ascot speedway near Los Angeles.

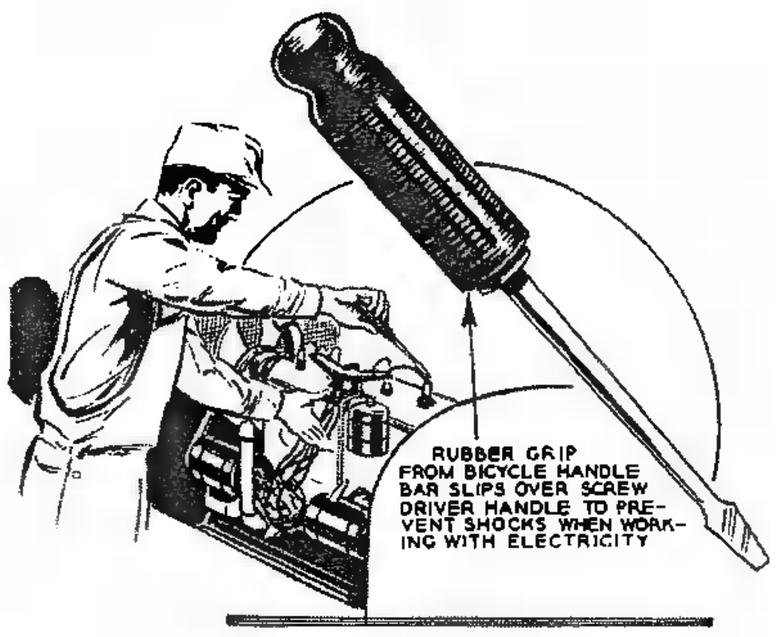
[*Continued on page* 126]

CRANKSHAFT CHRONICLES · · · by Hi Sibley



THE HIGH, WIDE AND HANDSOME "HOLSMAN" COULD ALMOST STRADDLE A TRAFFIC COP, WHILE THE "CRESTMOBILE" WENT TO THE OTHER EXTREME AND WAS DESIGNED TO PARK UNDER THE PORCH.

TESTED KINKS FOR THE MOTORIST

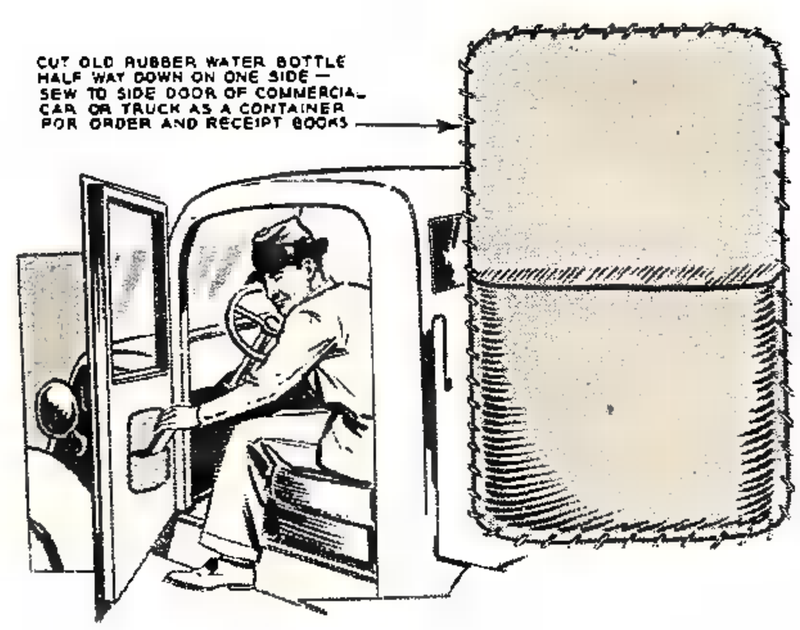


Bicycle Grip Insulates Screwdriver

EVERY auto mechanic knows that shocks received while working on high tension ignition circuits are by no means pleasant. If you own a screwdriver provided with a wooden handle it can be thoroughly insulated by fitting it with a bicycle handle grip. If the wooden handle is too large to accommodate the rubber grip, trim it down, with a rasp or pocket knife, to a firm fit and shellac the grip in place.—Bob Poulson.

Hot Water Bag Forms Door Pocket

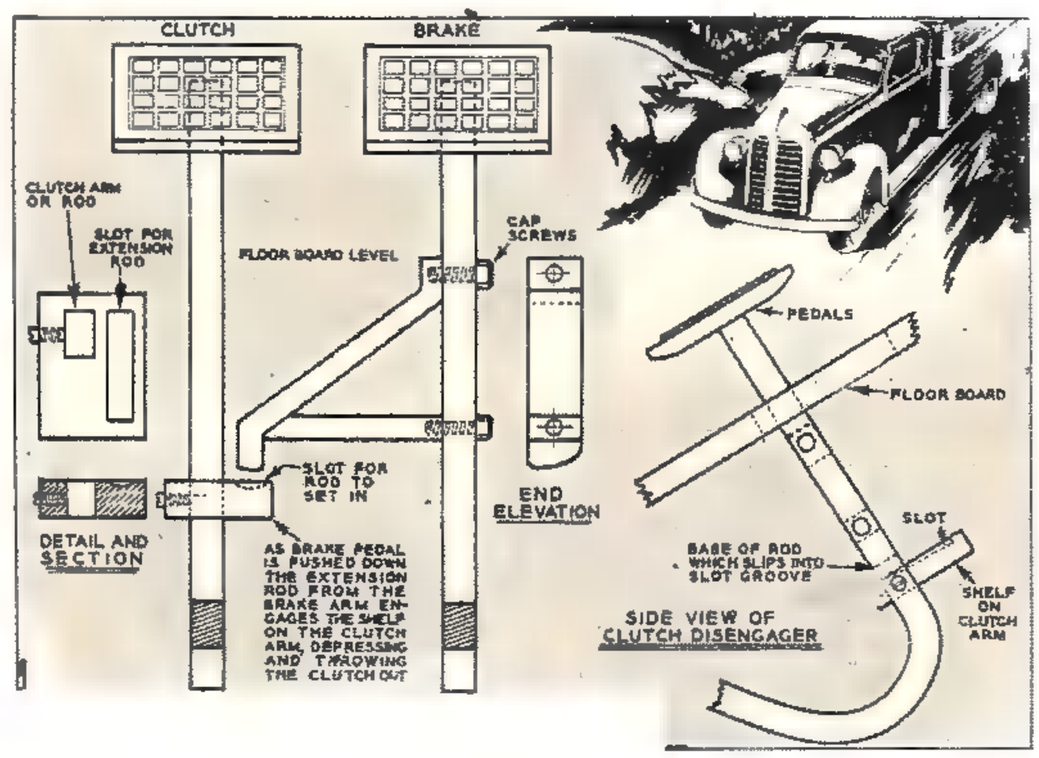
IF YOUR car or truck lacks a door pocket, a serviceable one can be made from an old hot water bag that is no longer usable for its intended purpose. With a pair of scissors, cut off the metal stopper and the front of the bag, to a depth of 4 inches from the top, so that a rubber pocket is formed. The door pocket is installed on the car by sewing it fast to the upholstery.—R. Paul.

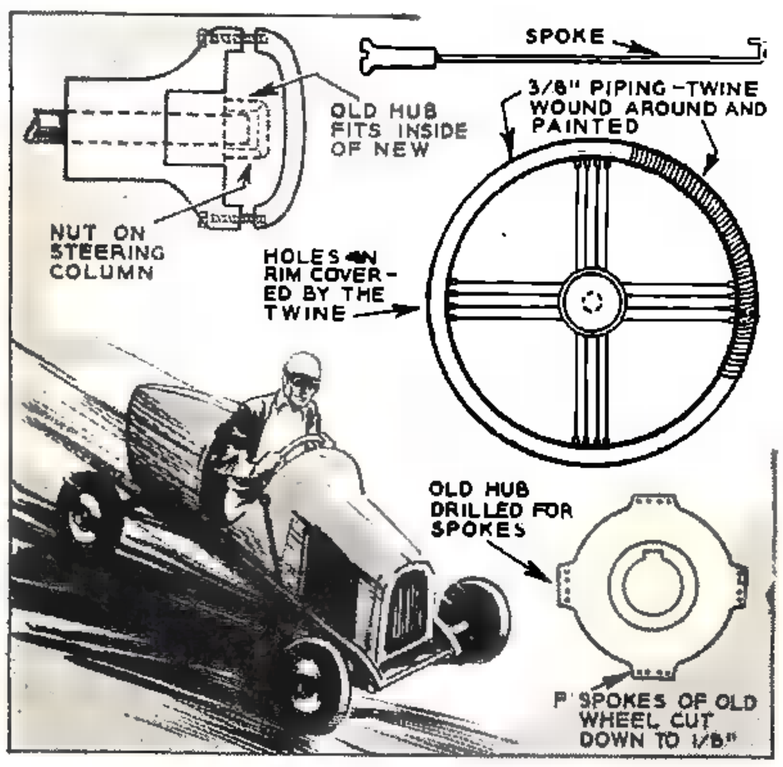


TIPS FOR THE AUTO ENTHUSIAST

An Automatic Clutch Release

ATTACHED to the brake pedal of the car, this device automatically releases the clutch when the brake is applied. A "V" bracket bolted to the brake pedal arm is provided with a hook on one end for engaging a slotted adapter which claps on the clutch arm. When the brake is depressed, the bracket pulls down the clutch at the same time, thus freeing the gears. But when clutch pedal is depressed, it works independently, having no effect on brake pedal.—L. W. Hochheimer.



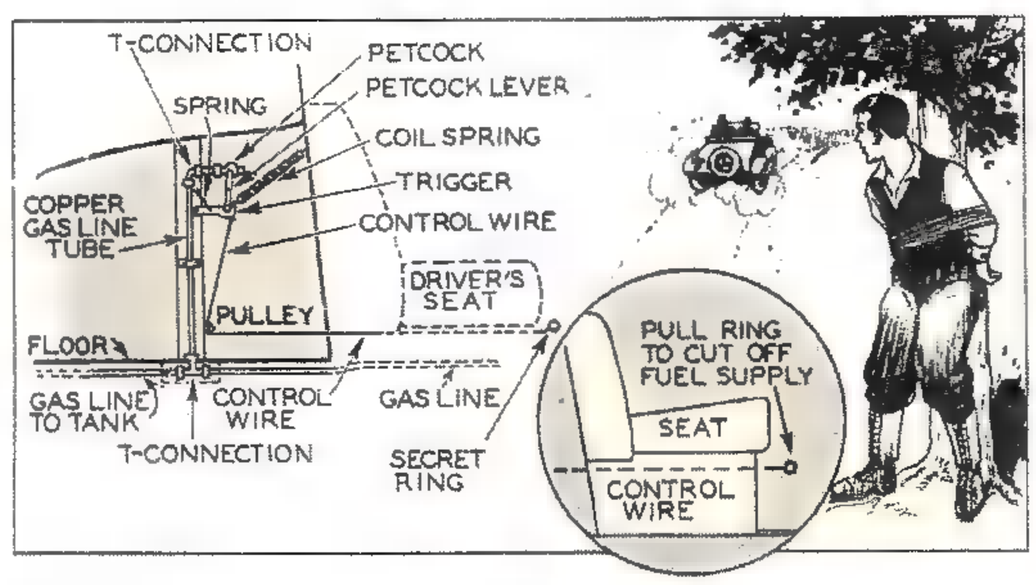


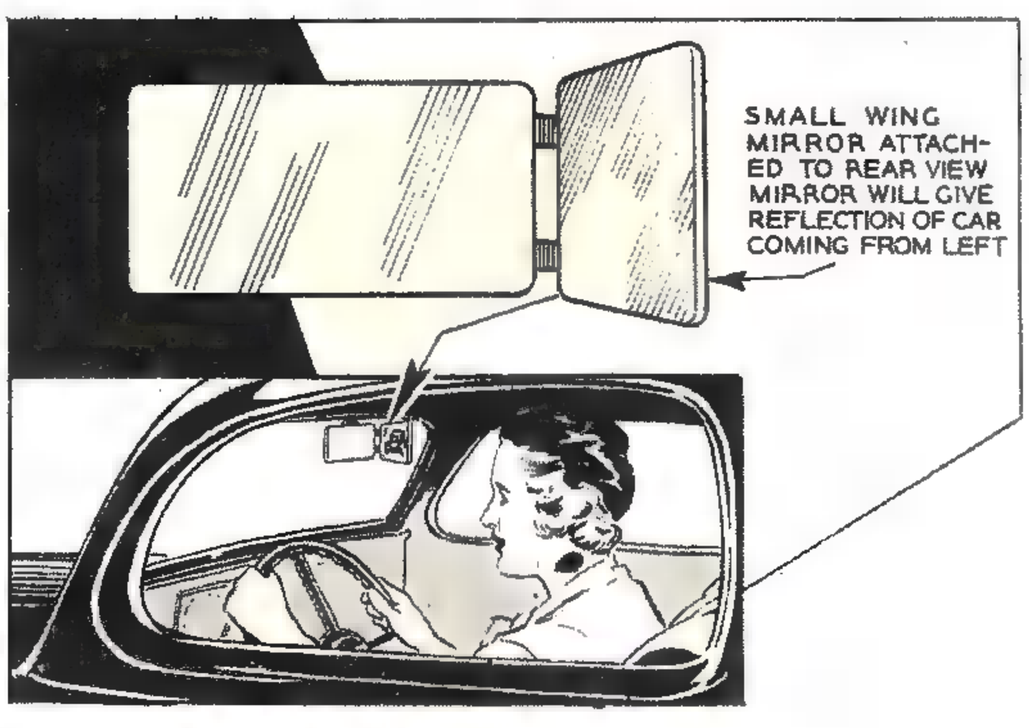
A Steering Wheel For Midget Cars

MIDGET car builders will find this flexible steering wheel a worth while accessory for their diminutive craft. Get a steering wheel from a Model T Ford and, with a hacksaw, cut away the spokes so that only the hub remains. Allow just enough of the spokes to remain on the hub so that holes can be drilled for inserting bicycle spokes. Form the outer rim of the wheel from a length of ⅜-inch iron pipe, bent to a diameter of 10 inches and welded at the joint. Drill holes in the pipe for the bicycle spokes, insert and draw all 16 spokes up tight. Complete the wheel by winding twine around the pipe and finally painting.—L. D. Bailey.

"Trip" Valve Prevents Theft

AUTOISTS ward off car theft by inserting a "trip" air valve in series with the gas line of the car. Connect a tee fitting, in the line, to which is connected a vertical length of copper tubing, fitted with a spring petcock, held closed by a simple trigger hook. A wire from the hook to drivers seat permits operator to render car inoperative.—J. E. Hogg.

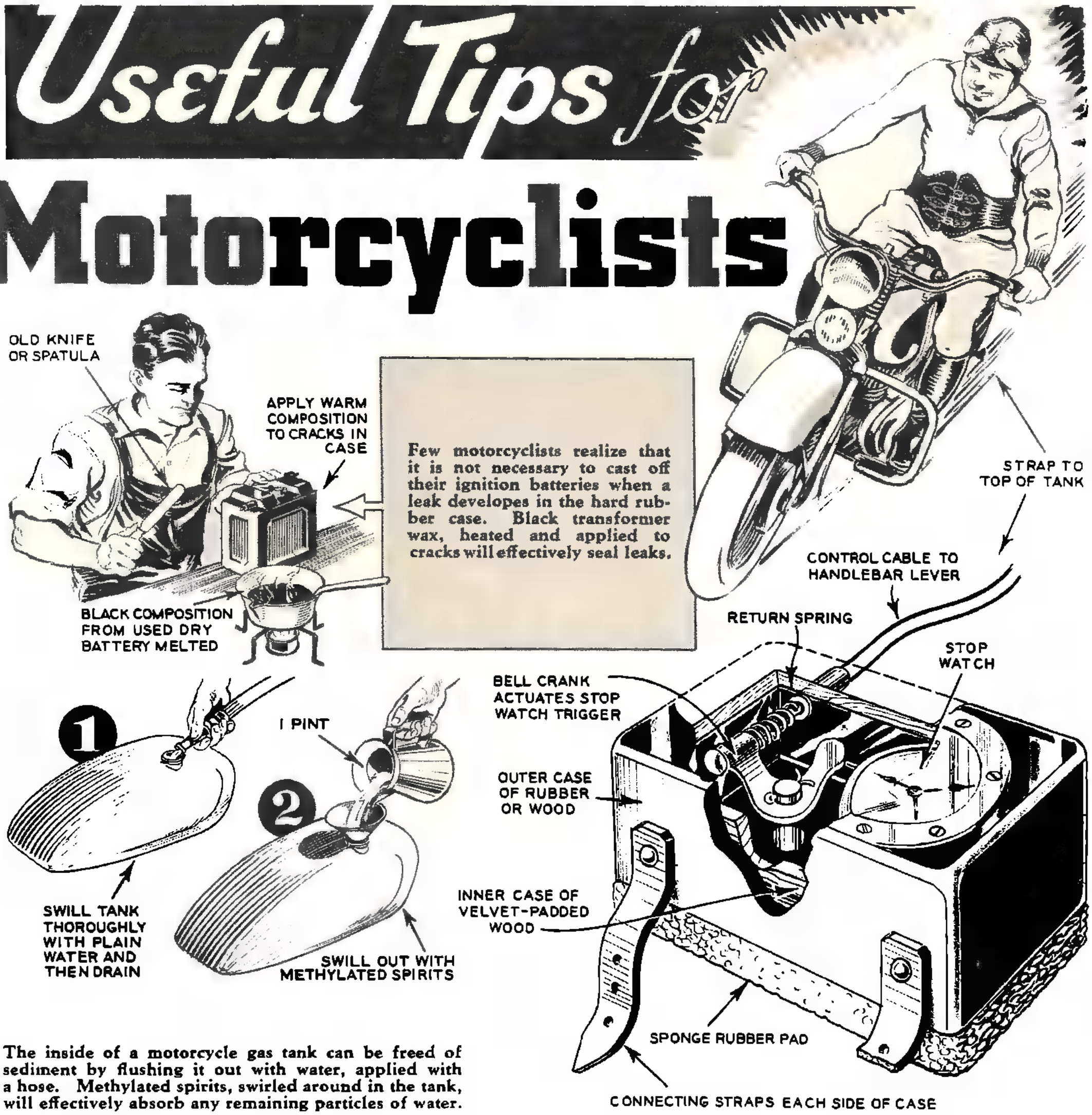




Winged Mirror Aids Driving

ON MODERN automobiles the rear vision header type mirrors are of little value so far as reflecting images of cars approaching from the rear left as in the case when one car passes another. By fitting a winged mirror along the righthand side of the header mirror this most common road hazard can be reduced to a considerable extent. Any glazier will supply a small mirror, for a few cents, which can be attached to the original rear vision mirror with adhesive tape.—L. Read.

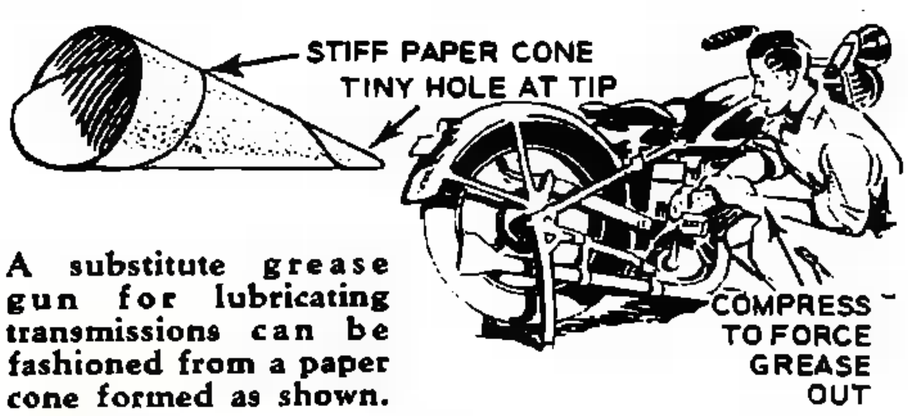
Useful Tips for Motorcyclists



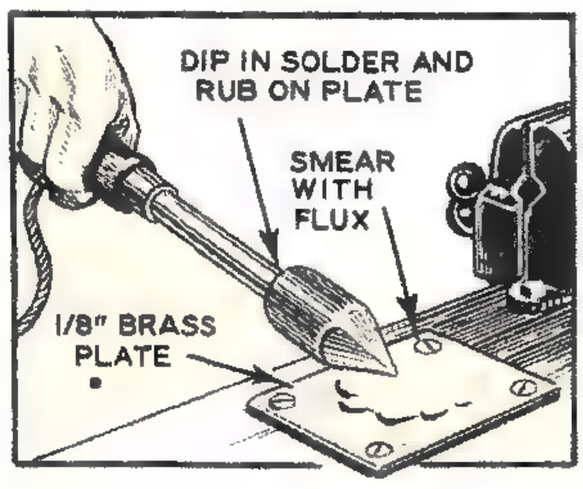
Few motorcyclists realize that it is not necessary to cast off their ignition batteries when a leak developes in the hard rubber case. Black transformer wax, heated and applied to cracks will effectively seal leaks.

The inside of a motorcycle gas tank can be freed of sediment by flushing it out with water, applied with a hose. Methylated spirits, swirled around in the tank, will effectively absorb any remaining particles of water.

The time required to cover a given distance can be accurately determined with this rider-operated timing device. Mount an ordinary stop-watch in a sponge rubber cushioned box so that the stopping and starting pin is directly opposite the bell-crank. Connect a spark control cable to the end of the bell-crank, as shown, so that when the handlebar lever is pressed by the rider the stop-watch goes into operation. Adjust timer by experiment and mount over gas tank.



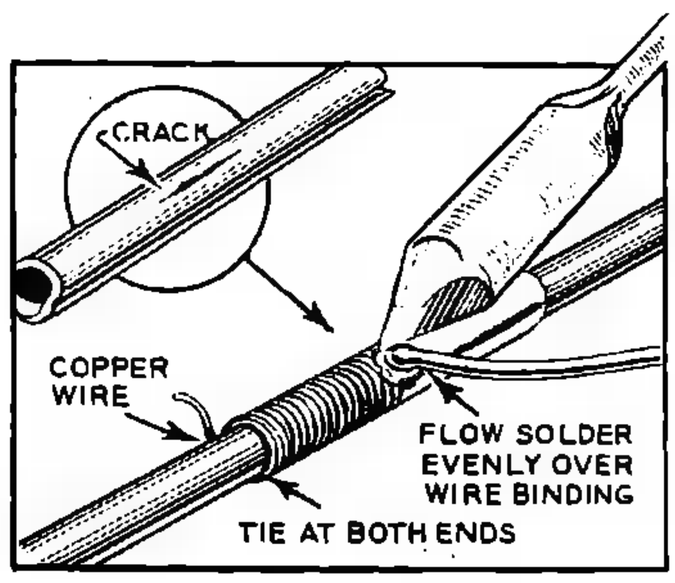
A substitute grease gun for lubricating transmissions can be fashioned from a paper cone formed as shown.



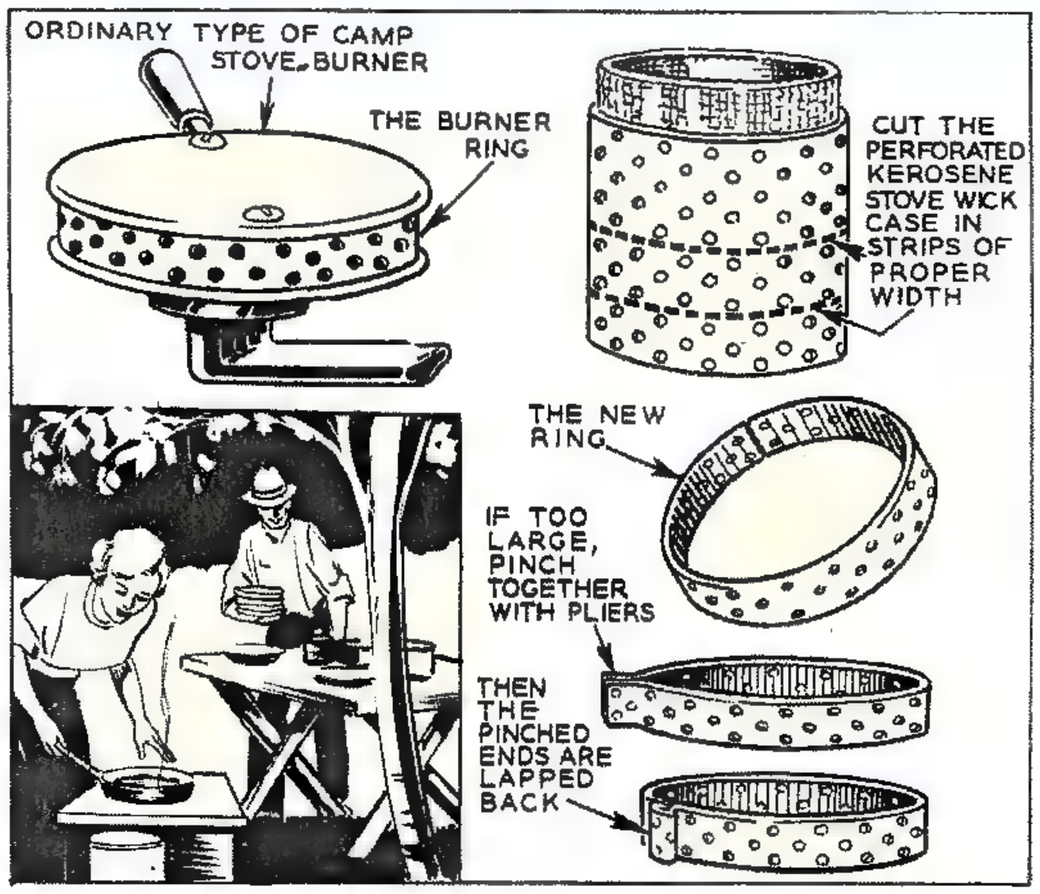
When making repairs on copper gas lines the use of a brass plate, smeared with flux, will insure a well tinned soldering iron that will remain thoroughly clean and bright at all times.

• • •

Leaks in fuel lines can be permanently repaired by cleaning the surface with steel wool, tinning and winding copper wire over the break. Seal by flowing solder over wire.



Kinks For Summer Campers



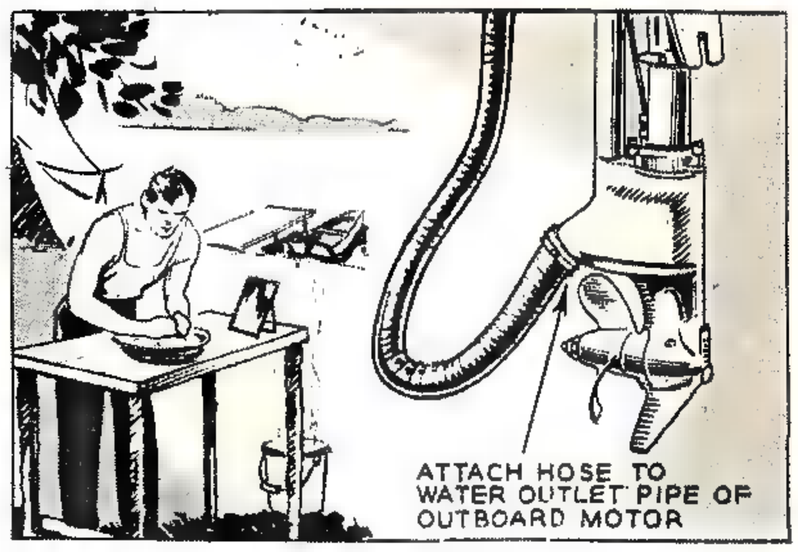
Making Stove Burner Rings

CAMP stove burner rings that no longer will produce a satisfactory flame can be replaced inexpensively by substituting sections cut from a kerosene wick case.

Cut the wick case into strips identical in width to those on the camp stove. Remove the screws holding the burner top in position and lift out the original ring. In replacing the worn out ring with the wick casing it may be necessary to crimp it so that a perfect fit is obtained. The camp stove burner is then reassembled and ready for use. The makeshift rings will function as well as the original rings did when new.—A. H. Waychoff.

Cellophane Protects Fishing Lures

WHEN worms, grasshoppers or minnows are used for bait when fishing in swift streams they are frequently washed off the hook by the current. This very disgusting trouble can be prevented by forming a small cellophane bag and tying it over the bait, leaving only the hook exposed. Under water the cellophane will not show and fish will bite at the line just as readily as they would if the cellophane were not there.—Emil J. Novak.



Outboard Motor Heats Camp Water

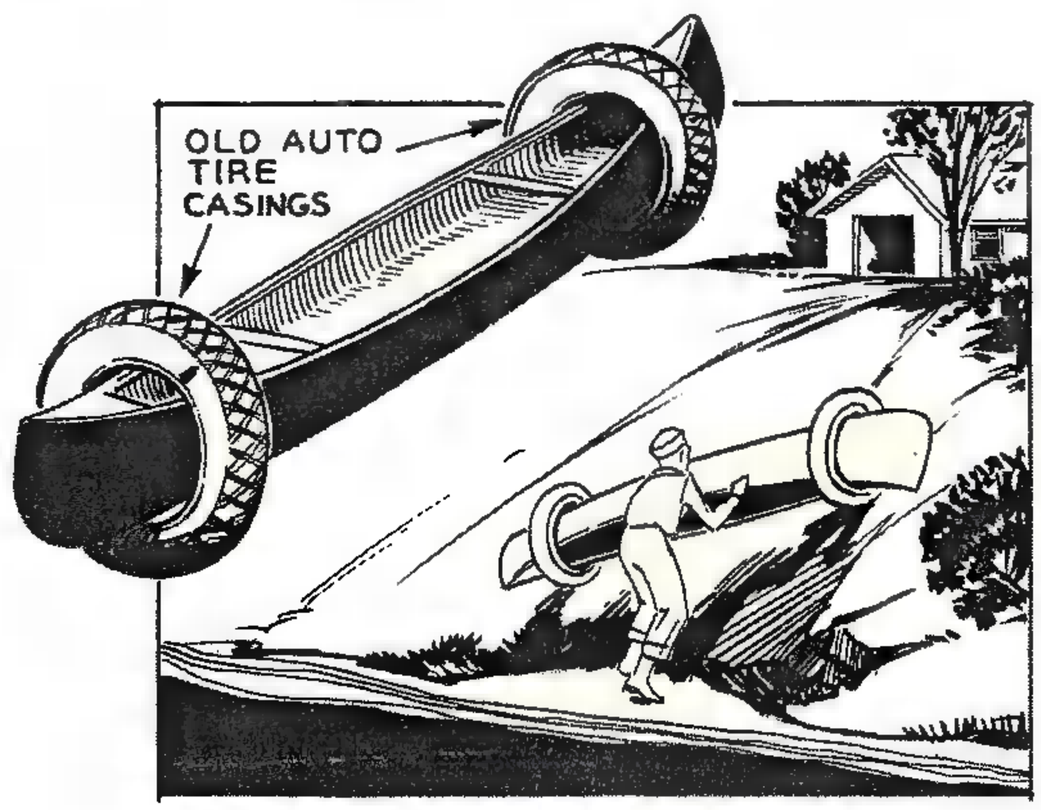
ALTHOUGH considered as a luxury by most campers, hot water has innumerable uses about the camp. If your equipment includes an outboard motor an adaquate supply of hot water is always at your disposal simply by attaching a length of rubber hose to the discharge pipe of the circulating system of the outboard.

The temperature of the water flowing out of the engine is approximately 110 degrees.—E. J. Novak.

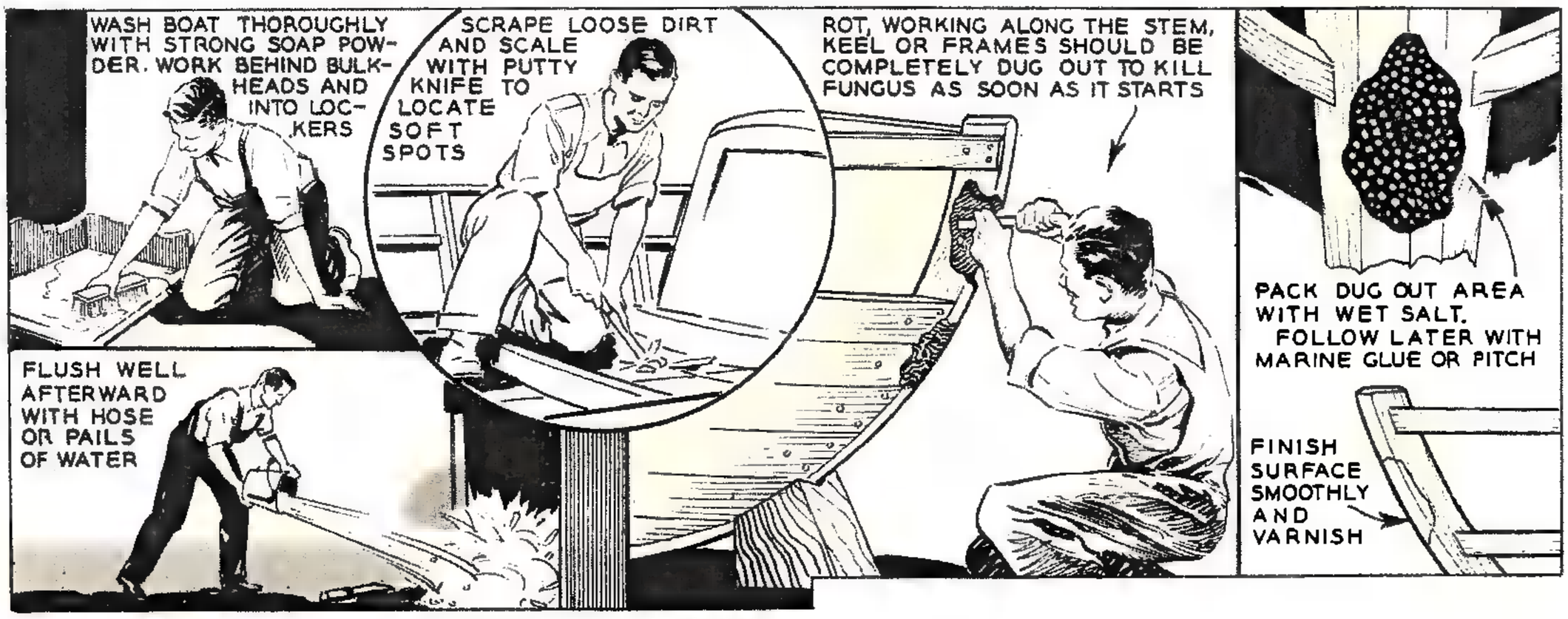
Canoe Rolled Ashore On Tires

CANOES and small boats can be rolled ashore single handed without loading them on a trailer or skid. Secure two large tire casings and slip one over each end of the boat pushing them over the craft as far as they will go. The canoe or boat can then be rolled to the boat house or garage without damaging the canvas.

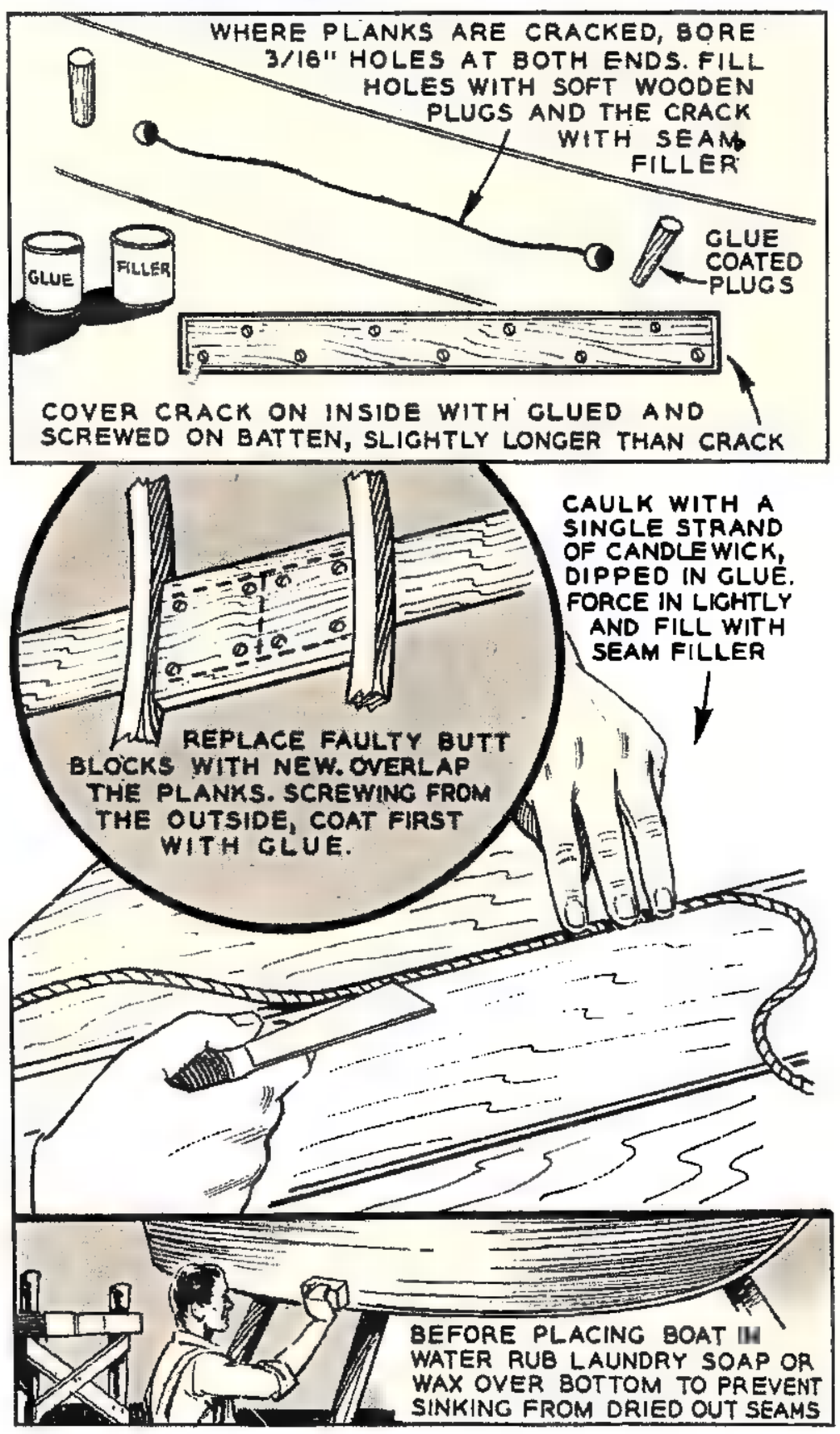
Larger boats can be handled in the same manner as small craft simply by substituting large truck tires.—A. H. Waychoff.



CONDITIONING YOUR BOAT



After a winter's storage, boats should be removed of their tarpaulin and allowed to dry out in the sun. The interior and exterior of the craft should then be scrubbed with soap and water. If dry rot is present kill by pouring salt in cavity.



Cracks in hulls can be repaired by drilling holes at each end of crack and driving in wooden plugs, then screw on battens as shown above. Caulk open seams with single strand candlewick which has been dipped in marine glue. To prevent a craft from sinking while swelling apply soft soap to seams.

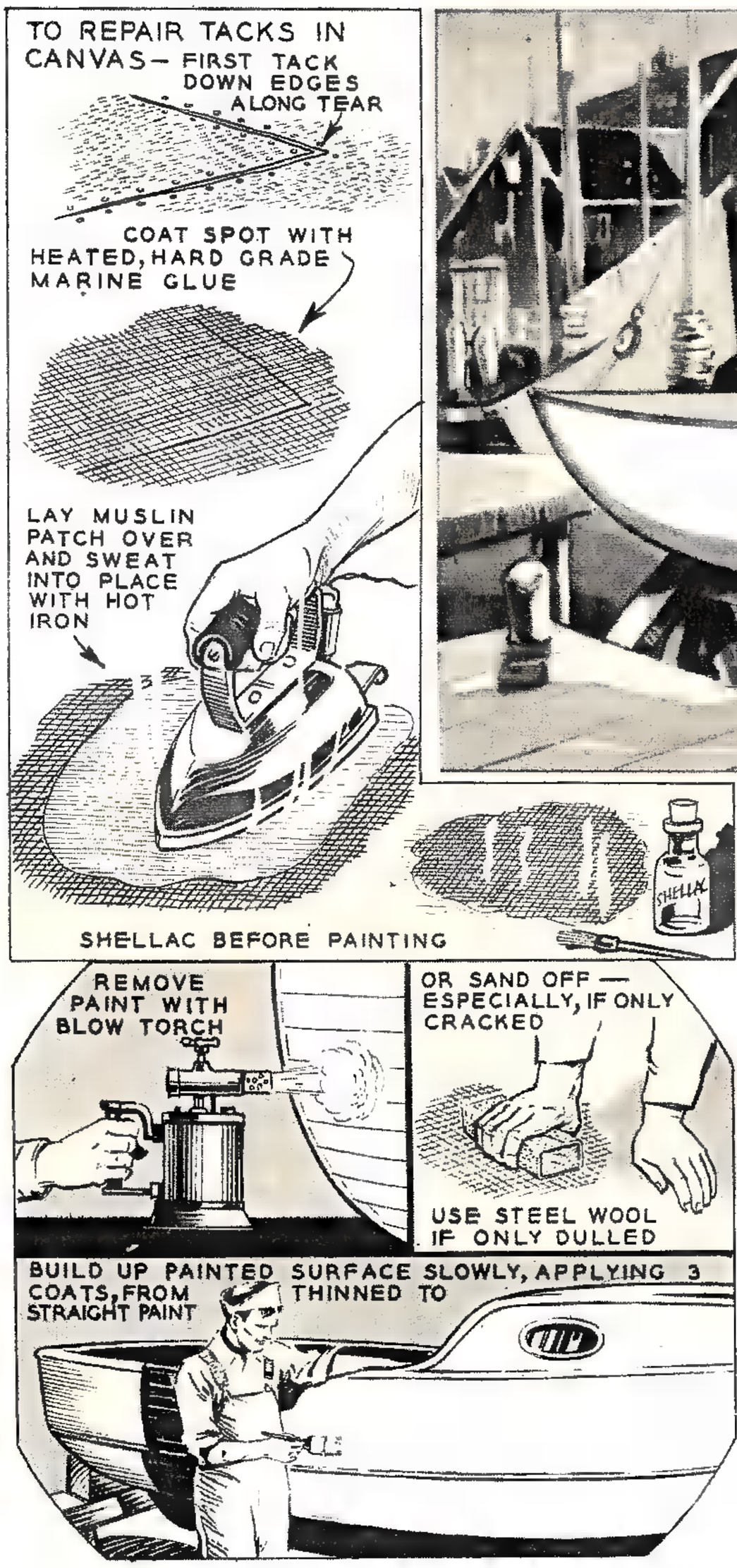
Few boats receive the attention they deserve. This article tells how many years can be added to the life of your craft by proper care of the sails, deck fittings, hull and finish.

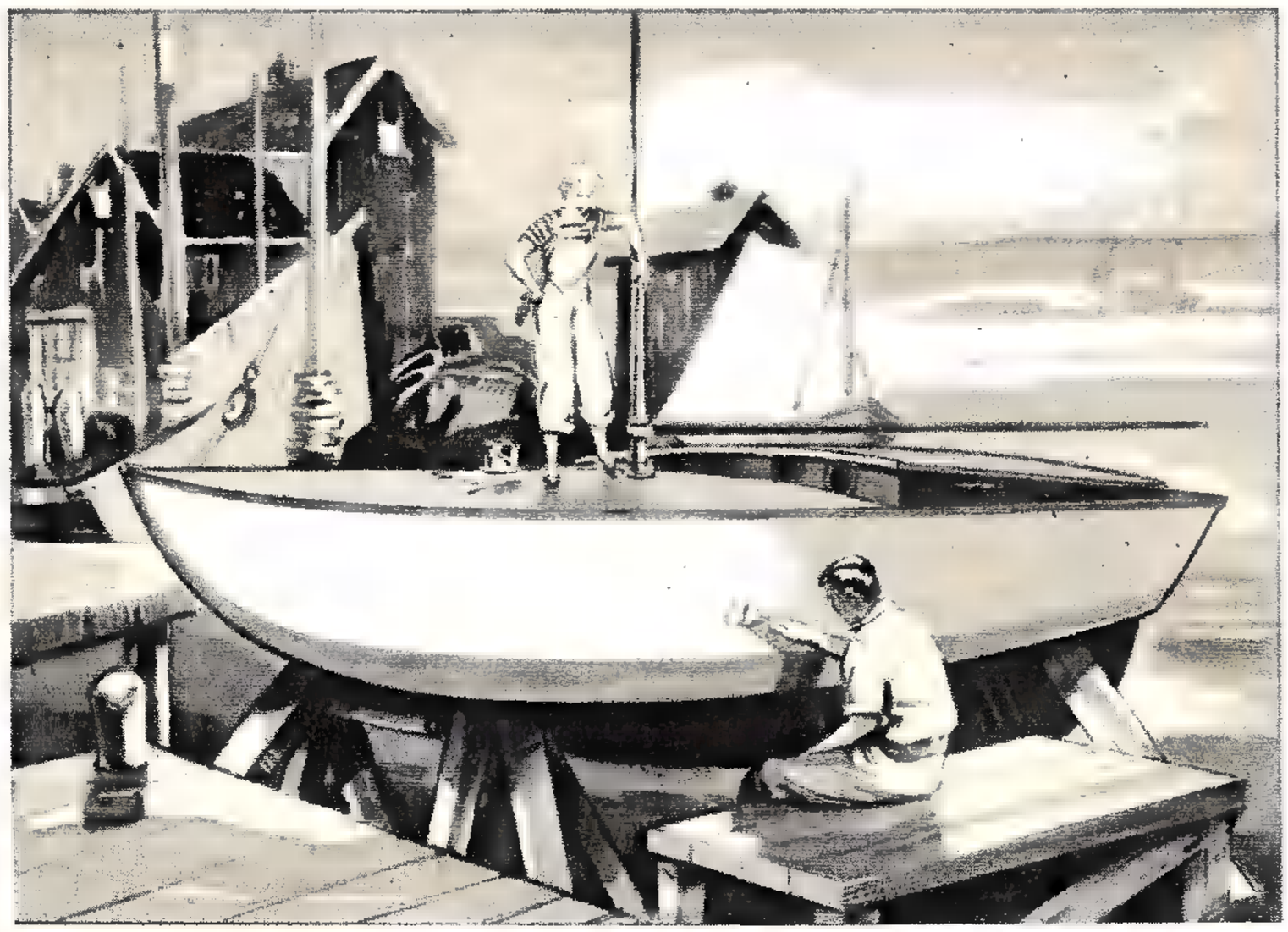
by J. A. Emmett

EVERY hour spent overhauling and fitting out your boat, whether it be a canoe, sailboat or motorboat, the latter either inboard or outboard powered, will not only return big dividends in the way of increased pleasure secured from your outfit, but add materially to the value of your investment in hull and gear.

Thanks to American inventive genius and today's wide awake manufacturers spring fitting out work is a comparatively simple matter to what it was not so many years back when less fortunate owners had to either use indifferent paints or mix their own, then wait days for surfaces to harden. Standardized small boats built of late years by reputable manufacturers are constructed of the best of materials; given halfway decent care structural repairs will not be necessary for years to come. Modern marine engines, both inboard and outboards, are clean in operation and sound engineering practice insures such long life that, barring accidents, overhauls are necessary but once in five years time and even then manufacturers stand ready to give a thorough factory job at minimum cost. Better cleaners, abrasives, rot preventatives

FOR SUMMER SAILING





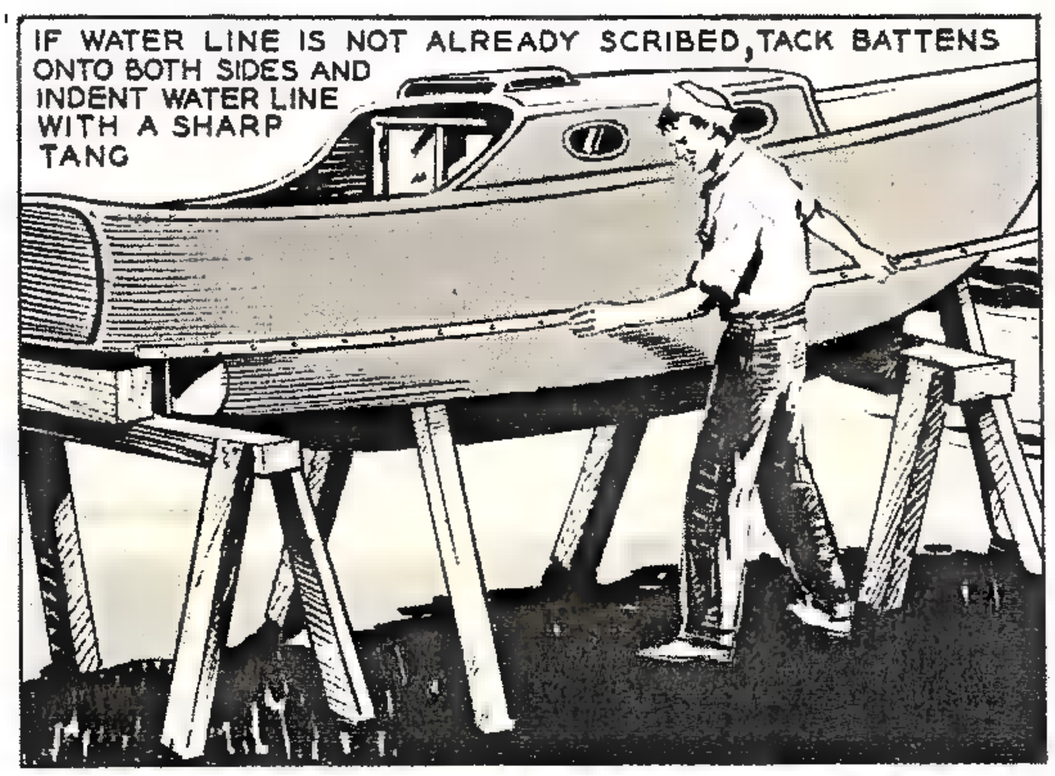
Canvas deck repairs can be neatly made by applying marine glue to the torn area and allowing it to dry. A piece of new muslin or light canvas is then placed over the glued surface and secured with a hot flat iron. Old paint should be removed with a file tang and blow torch. In repainting a boat apply a thinned coating first, slightly thinned second coat and straight paint for the final. Use turpentine for thinning the paint.

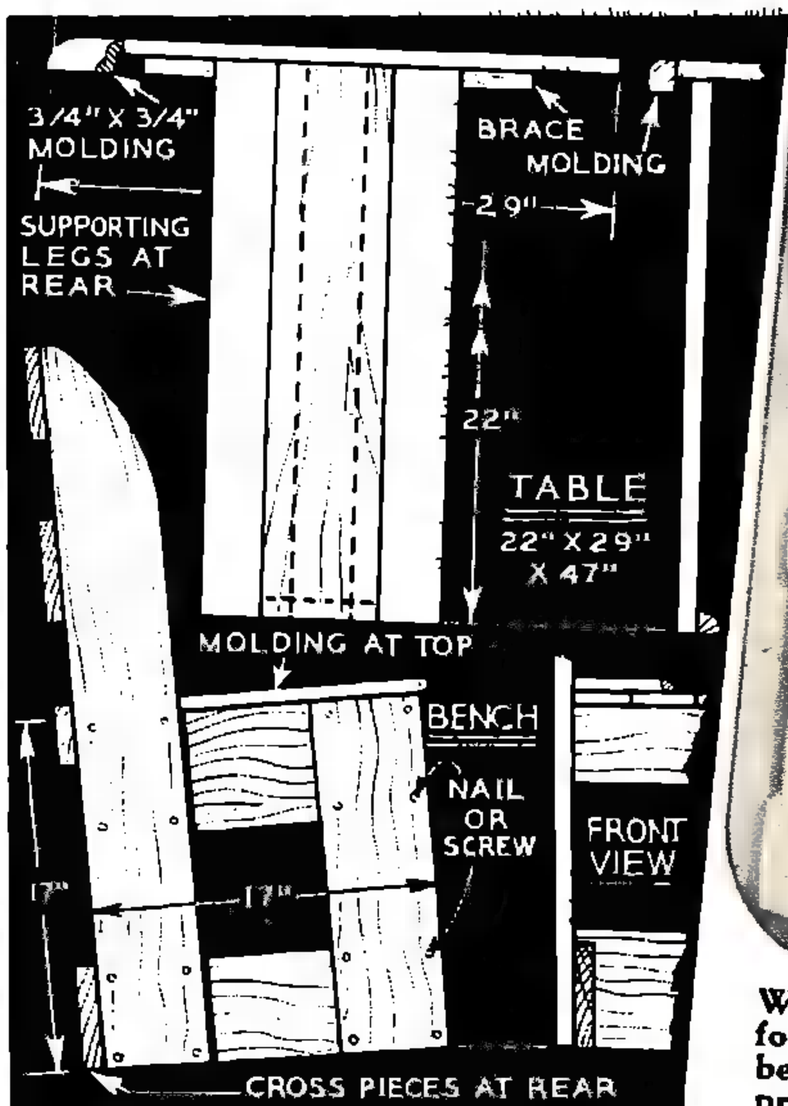
and solvents enable the owner to secure a cleaner undersurface for later painting in the shortest possible time and quick drying paints developed especially for boat use shorten the finishing period, offset the unreliability of spring weather and give a surface to withstand a full summer's use.

If your boat has been covered with a tarpaulin, get the canvas off the first warm day and let the air dry out the winter's condensation. Take out loose gear and removable fittings preparatory to a thorough cleaning, unless removed last fall as they should have been. More washing and less covering dirt with paint will save fitting out time and money and add years to the life of your boat. Use a strong soap powder even if it dulls and washes off paint. Scrub into every corner, inside and out, especially behind bulkheads and in lockers. Scrape with a putty knife to remove loose scale and dirt and to locate possible soft spots, then flush clean with a hose or pails of fresh water.

Soft spots caused by dry rot become apparent at fitting out time. Look for them in unventilated places and where fresh water lodges. If located, do not leave because rot

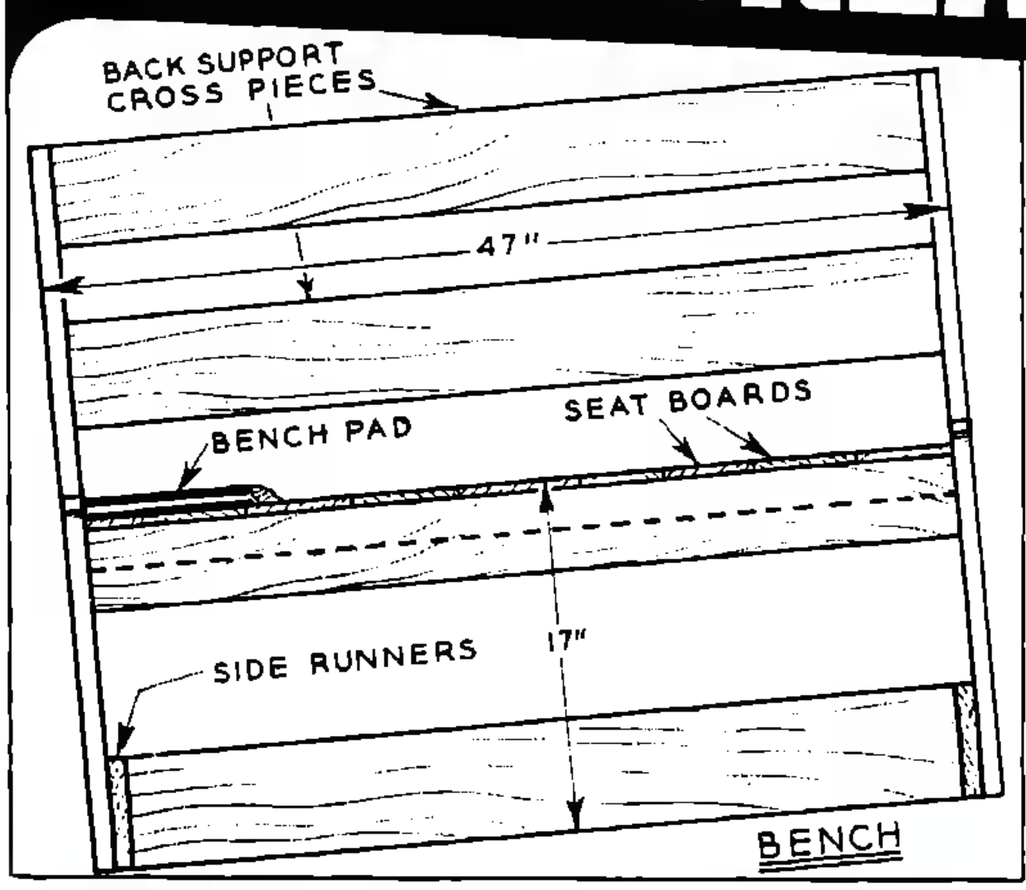
[*Continued on page* 132]





Wood salvaged from old packing cases constitutes the materials required for building this modern-style breakfast nook. Assembly details of the bench and table appear at left. The kind of wood used in constructing this project is not important since an enameled finish covers all surfaces.

$2.50 Breakfast Nook



The benches and table each measure 47" in length. The above plan shows front view of bench, giving all basic dimensions. Width of back supports and runners depends on stock used.

by J. B. Williams

IF YOU are one of those persons who have more time and ideas than money at your disposal, you can build this useful breakfast set from lumber salvaged from old packing cases which can be picked up, from time to time, at local department stores. The completed project should not involve an expense of more than $2.50, most of this amount being invested in several cans of paint and leatherette material for making the bench pads.

If possible, select boxes assembled from boards of uniform width. While planks varying in width can be used, considerable time can be saved by using lumber which requires no extra sawing and planing. The boxes should be salvaged carefully so that no

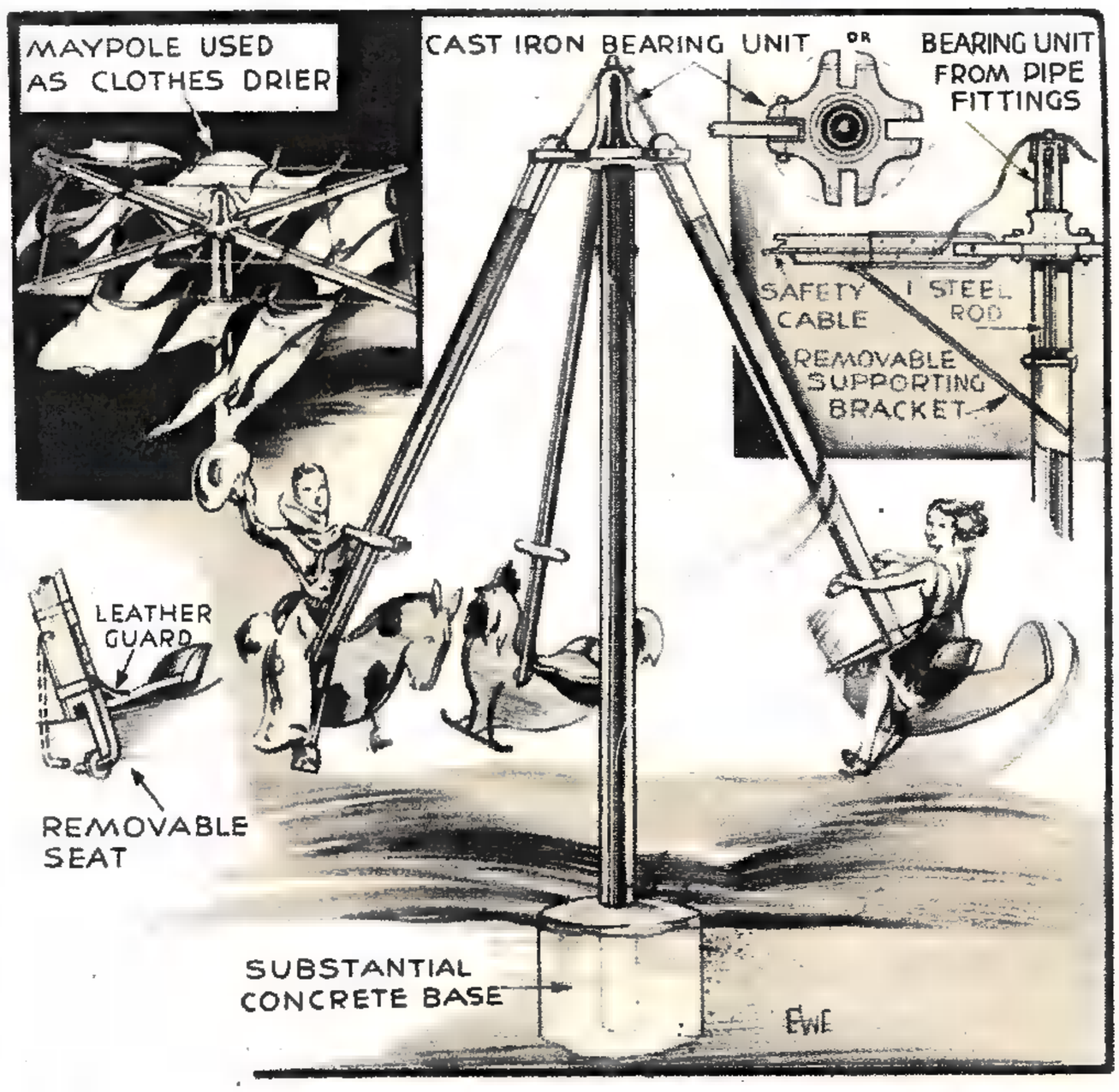
[*Continued on page* 136]

Kiddies' "Whirl Swing" Combines Clothes Drier

A LAWN clothes drier that combines a thrilling "Whirl Swing" for children can be built from odds and ends at a negligible cost. The arms of the clothes drier, when not used for that purpose, are fitted with hobby horses to accommodate kiddie riders.

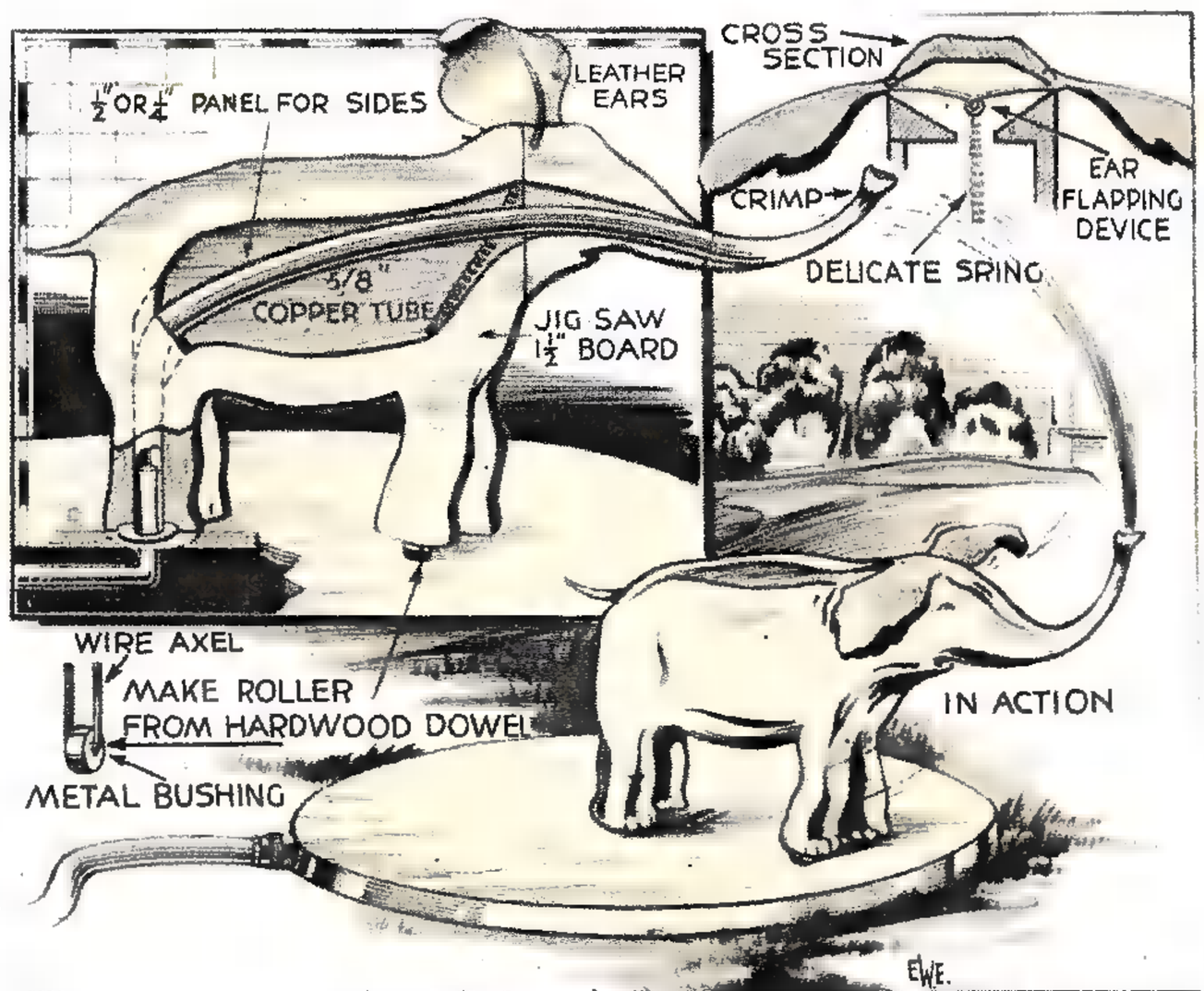
Make the upright post from a length of 2½ or 3-inch iron pipe and anchor it in a concrete foundation below the level of the lawn. Atop the post, mount a cast iron bearing unit, made as described in the details at left or, if desired, an auto wheel from which the rim and a portion of the spokes have been removed.

Make the swinging arms from 5-inch by 1½-inch oak, anchoring them to the bearing unit with long bolts. Attach horses, cut from 5-ply veneering, to opposite ends of arms in such a manner so as to permit their removal when not in use.

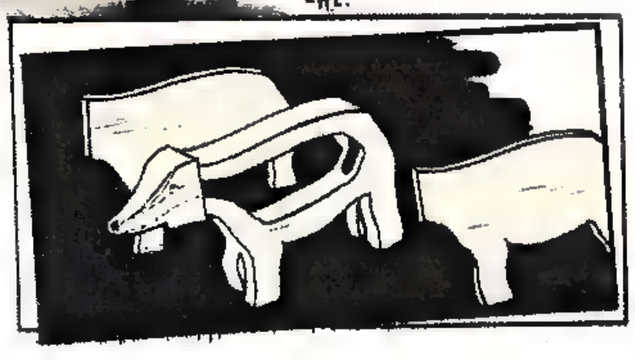


This entertaining childrens' toy is quickly converted into a clothes drier, thus serving two useful purposes. Make the upright post from a length of 3" iron pipe, anchoring it securely in a concrete base. Bearing on which the swings revolve is made as described above or fashioned from hub of an auto wheel.

Animated Elephant Sprinkles Lawn With Its Trunk



When water pressure is applied, this animated toy elephant wiggles its ears and at the same time sprinkles the lawn with its trunk. Scrap pieces of wood are used in forming the body. Cut these pieces as shown at right. A light spring connects to the wires holding ears so as to provide wiggling motion.



ANIMATED by centrifugal force, this lively elephant garden decoration serves also as a practical lawn sprinkler. The body and head are shaped from scrap wood, while the trunk is formed from a piece of ⅝-inch copper tubing which passes through the body of the elephant and down through the right hind leg to the base where it connects to a length of smaller tubing to permit its revolving around in a circle.

Cut the wooden body from a piece of 1½ by 16 by 10-inch white pine using a jig saw for the operation. Two pieces of plywood of similar dimensions are likewise cut to shape to form the sides. Insert the copper tubing to form the trunk and crimp the end so that a spray of water will be ejected when the elephant is placed in operation.

A WALNUT and COPPER

by Dale R. Van Horn

FEW home workshop projects will find greater appeal during the hot summer months than will this turned walnut ice bucket. The hostess will take considerable pride in using it when serving party guests, for its antique design will undoubtedly bring many favorable comments. By slightly altering the original dimensions, either larger or smaller, the bucket can be used also as a bottle chiller for tomato or fruit juices or as a smart container for candies and nuts. For the latter purpose, a spun copper lid provides the bucket with a distinctive closure.

Get a solid piece of wood if possible or glue up pieces to give you a square slightly less than 5 by 5 inches and about 9 inches long. This particular job was turned inside with a metal lathe because of its depth and because the sides could be made more accurately.

After the inside had been turned, the piece

Turn the ice bucket from a solid or glued-up block of walnut measuring 5 by 5 by 9 inches. The inside of the container is best turned on a metal working lathe in manner shown above.

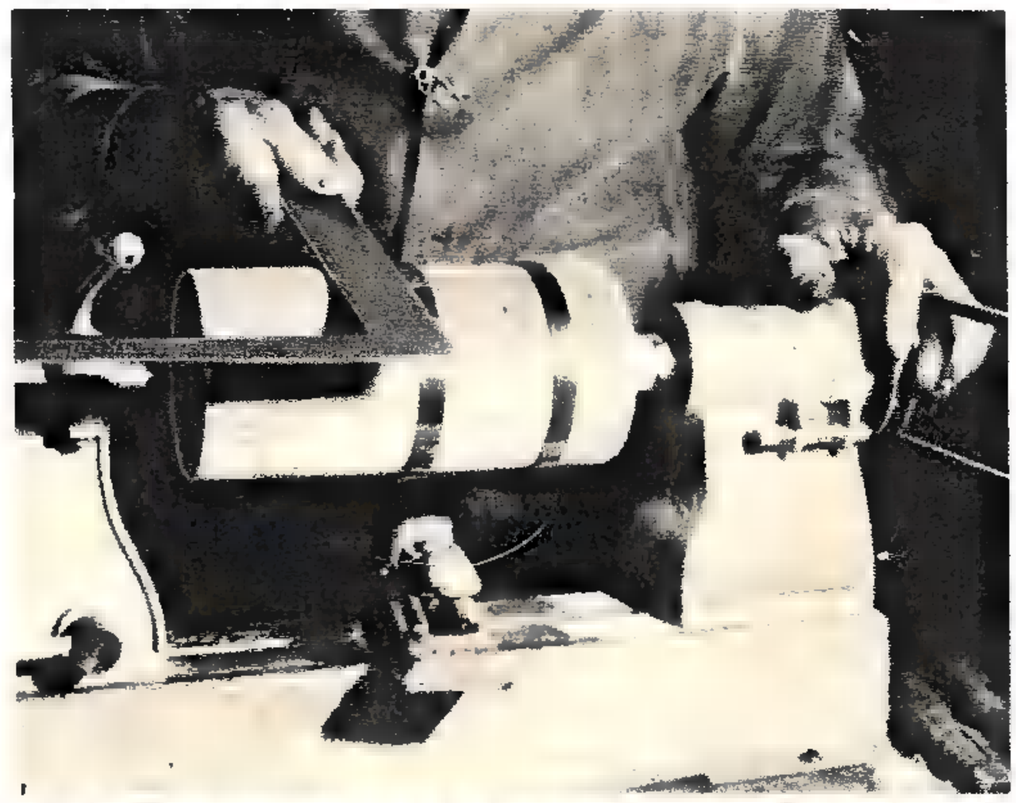
was transferred to a jig in the wood working lathe, snuggled to a tight fit, the tail stock brought into use and the outside turned down to the dimensions shown. Note that whereas the final outside diameter at the top is 4½ inches, it is only 4⅜ inches at the bottom. The bottom diameter can be 4 7/16 inches if you care to work with close figures. The slight taper is not noticeable to the eye, but it does permit the tapping of each hoop to a snug fit after the ends are soldered.

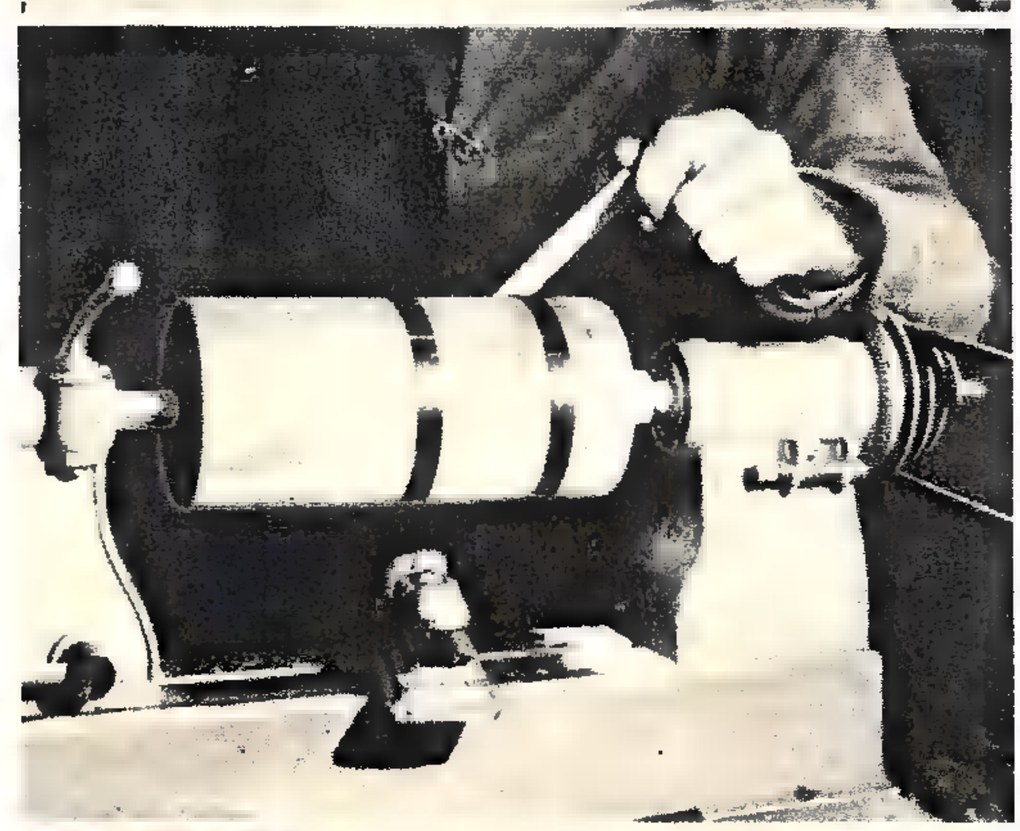
Cut the copper strips for the hoops ½-inch wide and of the necessary length, including a ½-inch overlap. To make a strong, yet scarcely noticeable, joint, lay ½-inch of each end of the hoop over the top of the vise and hammer flat until the copper is approximately one-half the original thickness. Turn the piece over and make the same mark on the opposite side of the other end. Heat these ends with a blow torch, one at a time, and tin them well by rubbing with solder. Make another check against diameter, clamp the joint at one edge with the pliers and again heat in the flame. When the solder is soft, quickly clamp the other side of the joint with another pair of pliers and hold until the solder has set. This makes a joint only slightly more than the original copper thickness and if you have matched the outside seam well

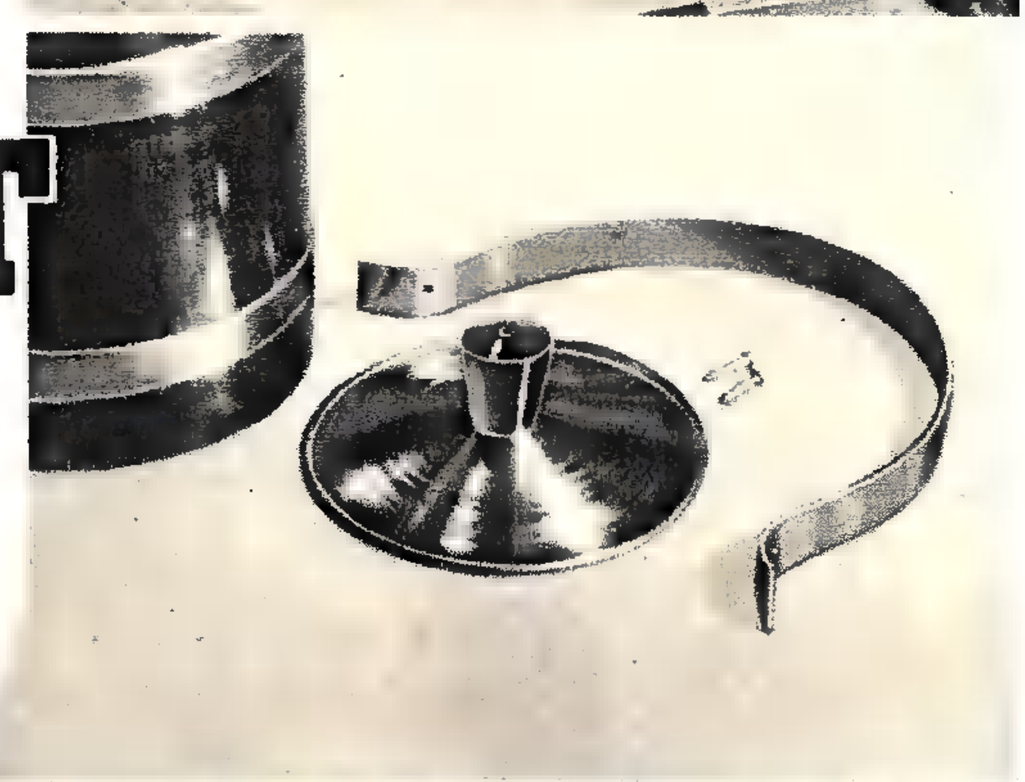
ICE BUCKET

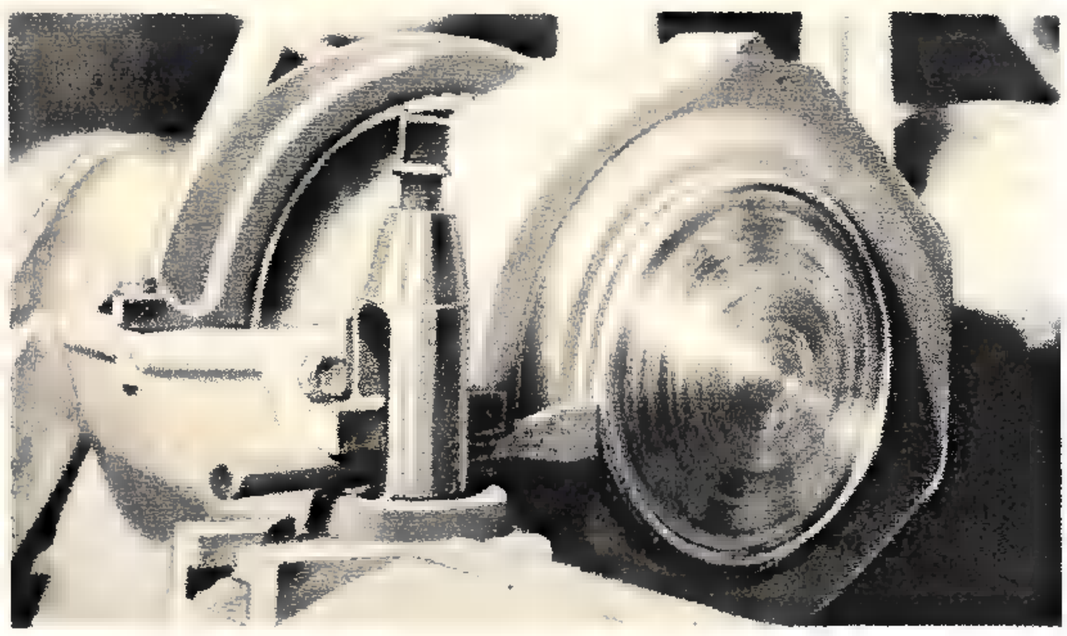
it will be inconspicuous. The next step is to tap the hoop home on the bucket. A tri-square or any flat metal having square edges will do nicely. Turn the piece in the lathe continually as you tap it in position to prevent breaking the seam. If hook is too tight,

[*Continued on page* 134]





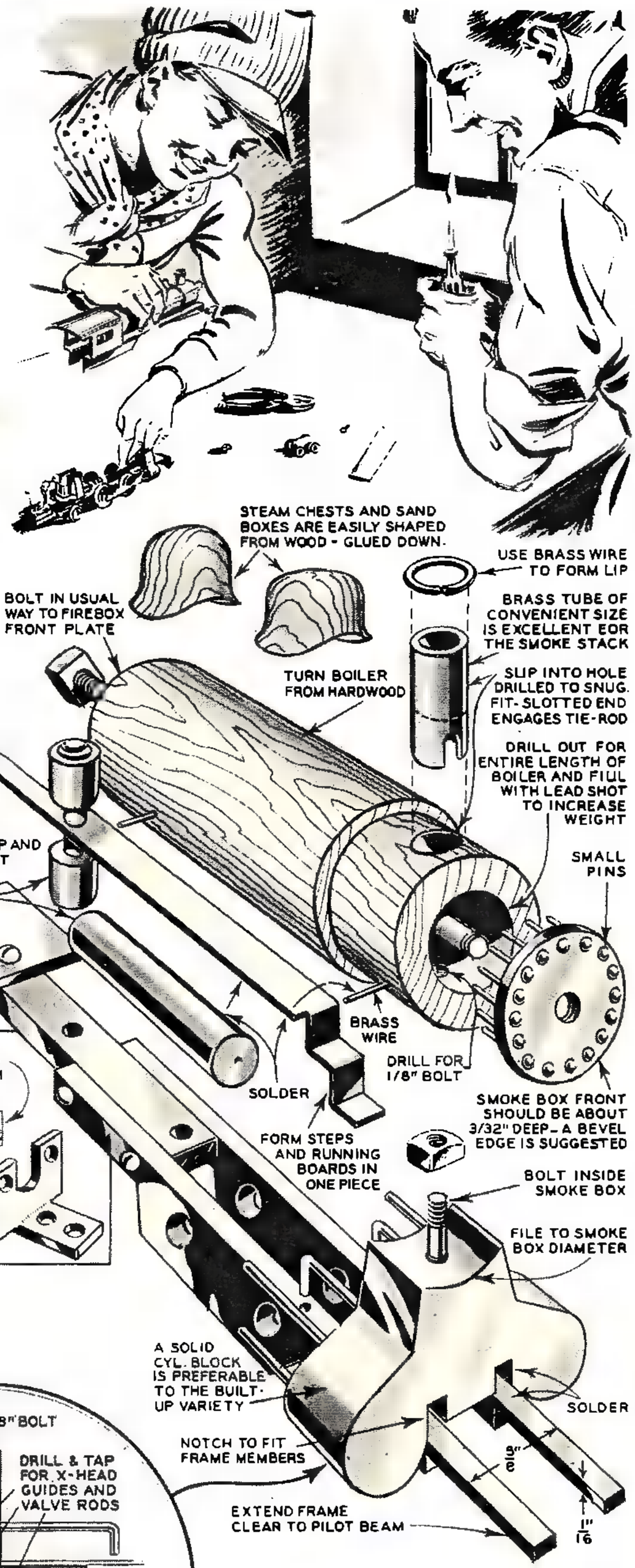




After completing the inside turning, remove the block from the metal lathe, turning down the outside to a diameter of 4½ inches. Copper hoops are then driven over the cylinder and trued up with a tri-square, after which they are polished with a file and steel wool as depicted in the above illustrations showing construction through the various stages. The lid jig is turned from pine and the copper closure spun over it. After spinning the copper lid, trim off the edges and remove pine jig.

Model Railroad Builders' Tips

Miniature locomotives can be made to perform better by use of these novel kinks.

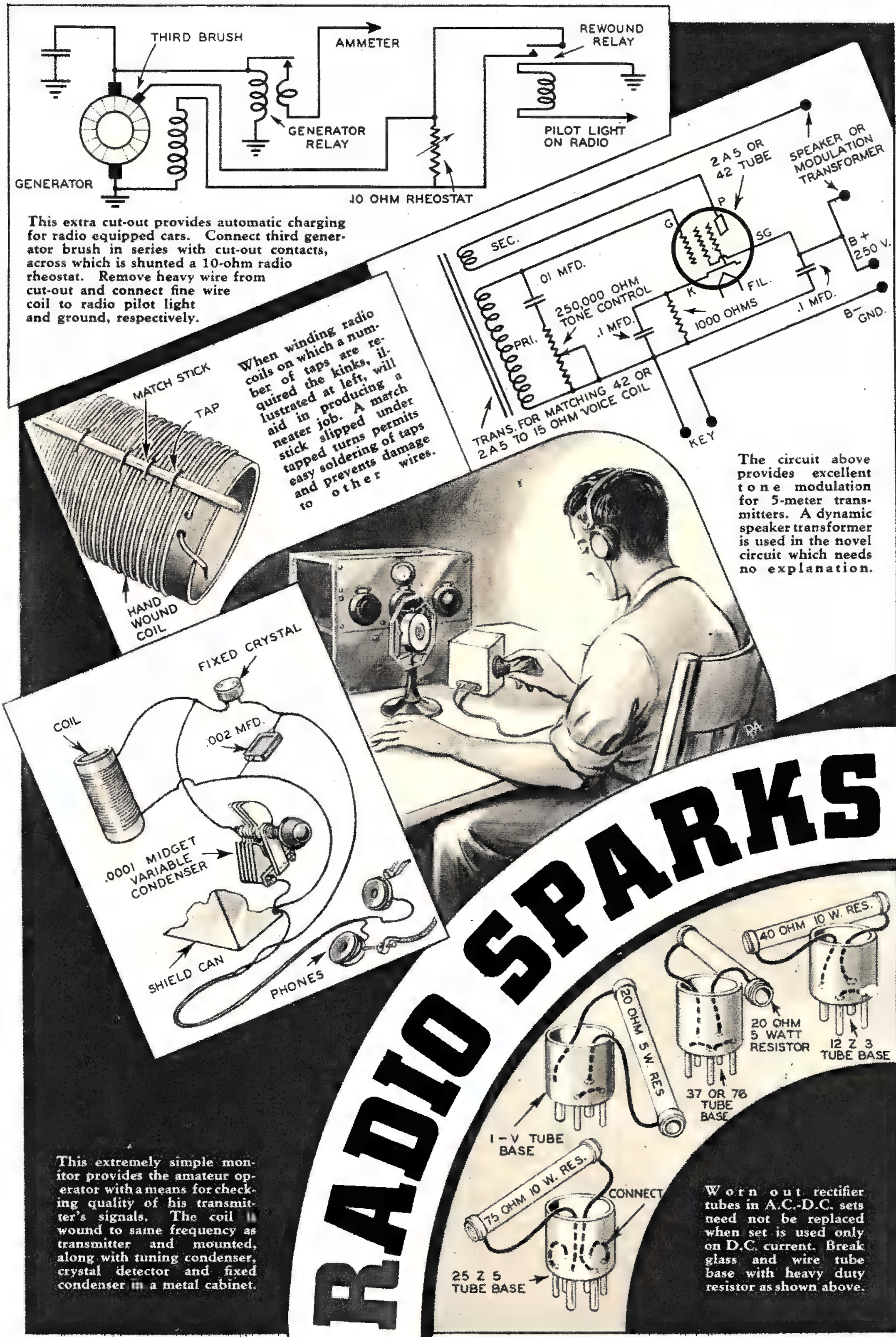


Most model locomotives suffer from superfluous soldering. A certain amount of soldering is not only unavoidable, but desired. Above is a good example of two methods of treating construction. Note that in Method 2, the same results are obtained with fewer parts and precision work.

Here is an excellent instance where precision methods count. The drive hook-up is of vital importance and must be properly and permanently aligned. Note heavy brackets recommended and the neat way in which reversing gear is placed by motor.

Model locomotives must be heavy to provide the necessary traction. The boiler and frame construction of "Midget Mike" as well as other Lilliputian models can be provided with more weight by using brass fittings as prescribed here. Wooden boilers can be weighted by filling them with lead shot. At the left are shown several simple boiler fittings that any model maker can duplicate.

RADIO SPARKS



This extra cut-out provides automatic charging for radio equipped cars. Connect third generator brush in series with cut-out contacts, across which is shunted a 10-ohm radio rheostat. Remove heavy wire from cut-out and connect fine wire coil to radio pilot light and ground, respectively.

When winding radio coils on which a number of taps are required the kinks, illustrated at left, will aid in producing a neater job. A match stick slipped under tapped turns permits easy soldering of taps and prevents damage to other wires.

The circuit above provides excellent tone modulation for 5-meter transmitters. A dynamic speaker transformer is used in the novel circuit which needs no explanation.

This extremely simple monitor provides the amateur operator with a means for checking quality of his transmitter's signals. The coil is wound to same frequency as transmitter and mounted, along with tuning condenser, crystal detector and fixed condenser in a metal cabinet.

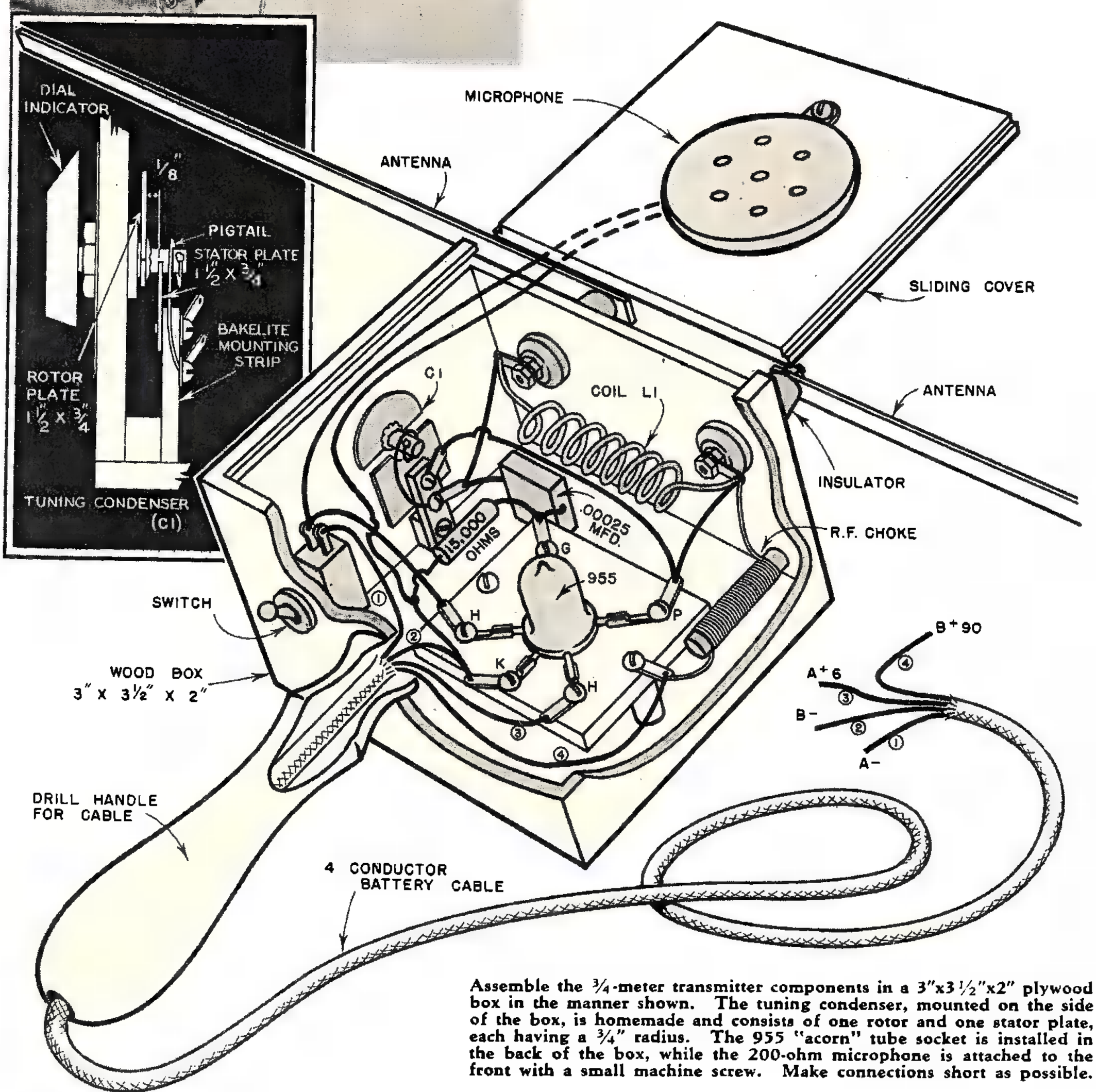
Worn out rectifier tubes in A.C.-D.C. sets need not be replaced when set is used only on D.C. current. Break glass and wire tube base with heavy duty resistor as shown above.

"ETHER IMP"—

by Bill Bartlett

PRESENTING the "Ether Imp," perhaps the tiniest, and certainly one of the most fascinating radio transmitters ever designed. It is so light and compact that it may be carried about even more conveniently than the conventional sports mike used by professional radio announcers at outdoor events. The battery supply for the transmitter is small enough to slip into coat or overcoat pocket and a small flexible cord from transmitter to pocket provides battery leads.

The ¾ meter band is destined to become popular with radio amateurs doing short dis-



Assemble the ¾-meter transmitter components in a 3"x3½"x2" plywood box in the manner shown. The tuning condenser, mounted on the side of the box, is homemade and consists of one rotor and one stator plate, each having a ¾" radius. The 955 "acorn" tube socket is installed in the back of the box, while the 200-ohm microphone is attached to the front with a small machine screw. Make connections short as possible.

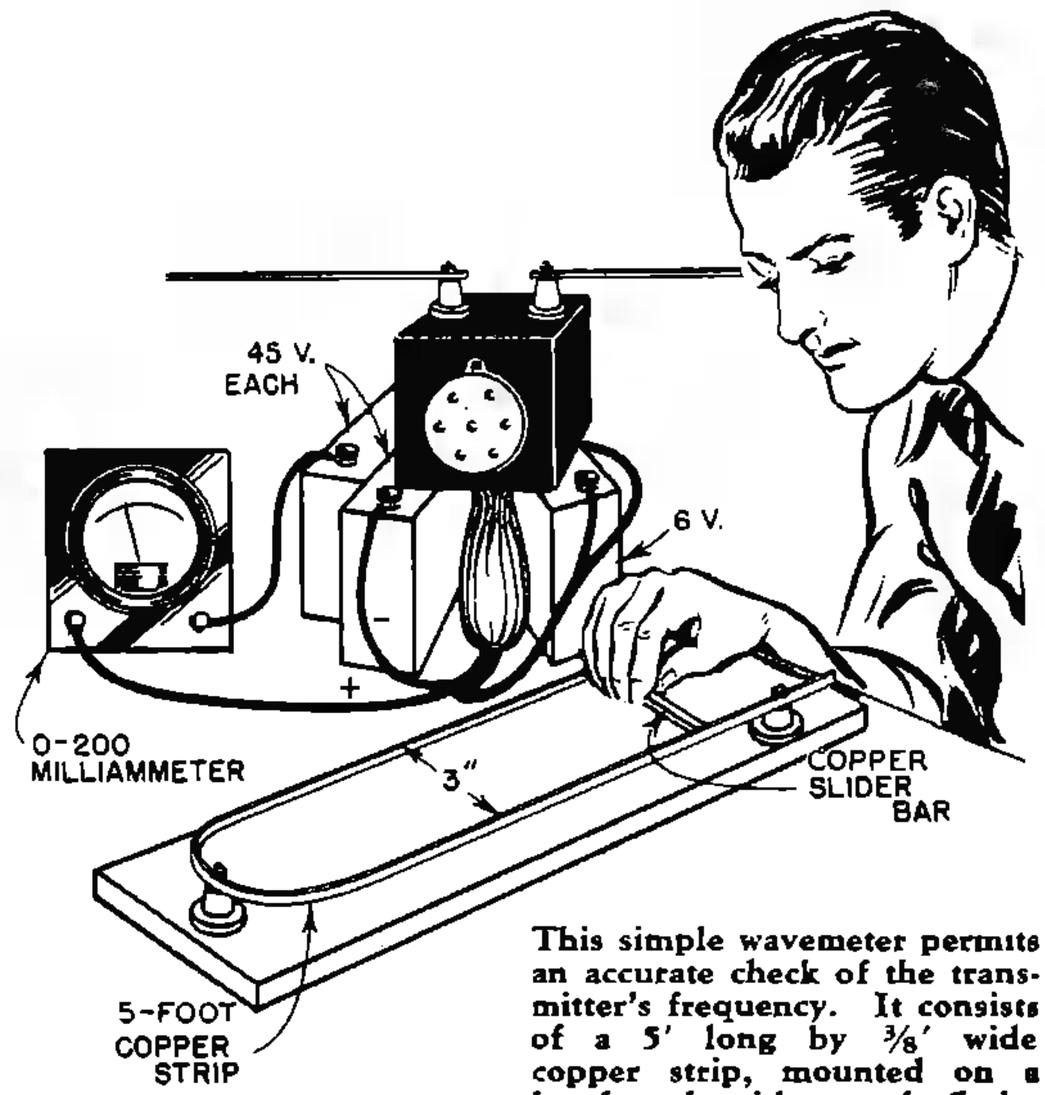
A 3/4-Meter Transmitter

No larger than a sports announcer's hand microphone, this tiny transmitter provides a novel method for transmitting on ultra-short waves.

tance work. The range of this transmitter is from one-half-mile, under poor conditions, to as much as two or three miles, or even better, under more conducive weather conditions. This is the ideal outfit for the beginner who wishes to maintain contact with a friend over a short range, or for the amateur who wishes to conduct ¾ meter field experiments during the summer.

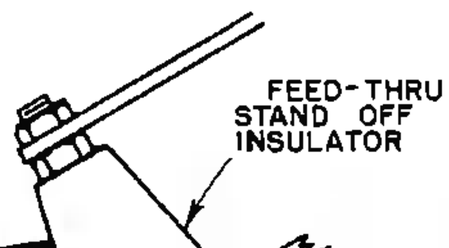
The transmitter is simple enough for even a beginner, with absolutely no experience, to build, since the parts are few and the diagrams show clearly the situation and connection of each part. The most important point of the construction is to keep all leads as short as possible since at this high frequency long wires in the circuit result in capacities that tend to pull the set out of its proper frequency band.

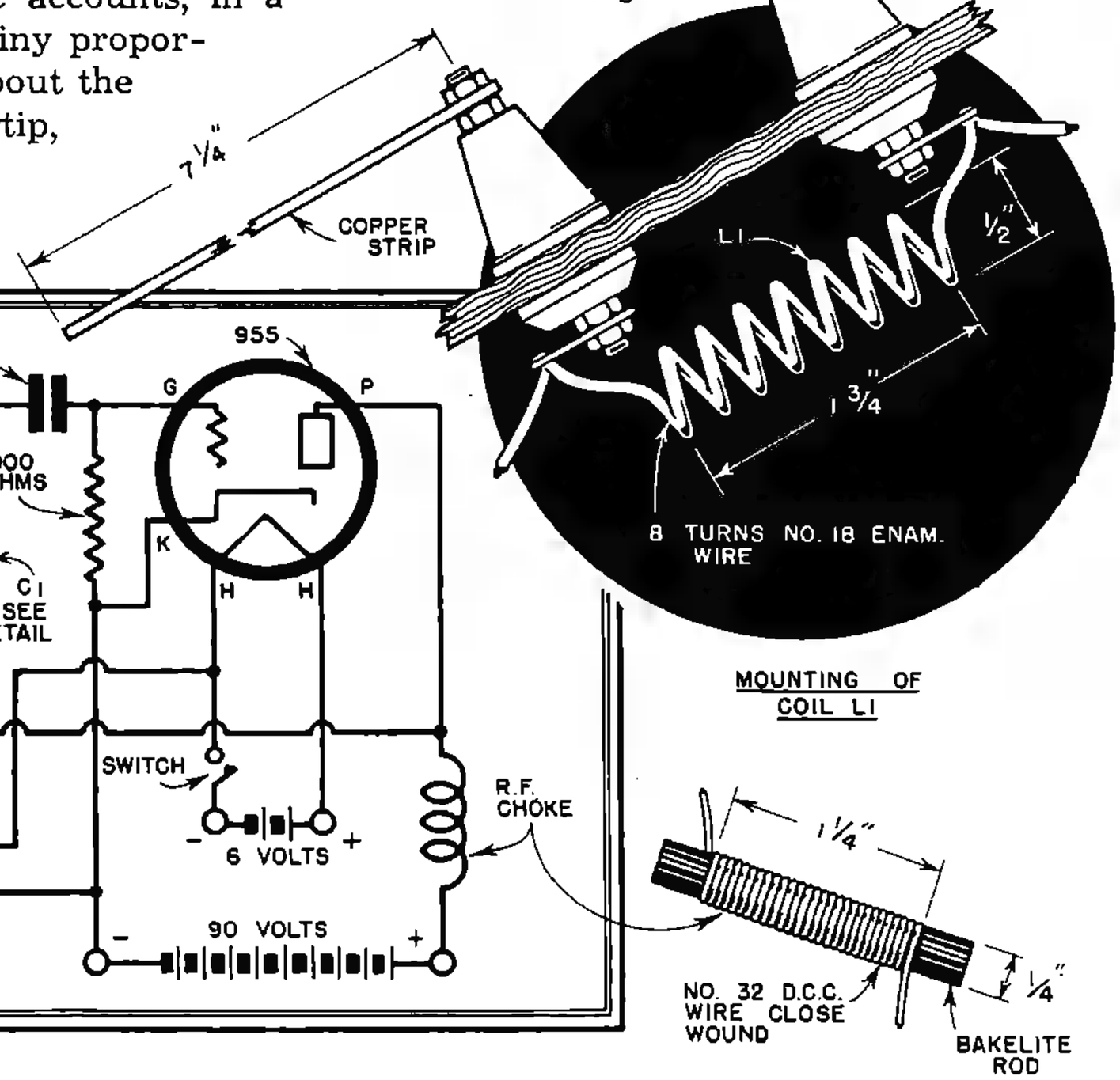
The type 955 "acorn" tube accounts, in a large measure, for the set's tiny proportions. This tube, which is about the size of a person's little fingertip, has a glass envelope [*Continued on page* 130]



Connect a 0-200 milliammeter in series with plate lead, bring wavemeter near transmitter and slide bar along strips until highest reading is obtained. Measure distance around bow to determine the wavelength.

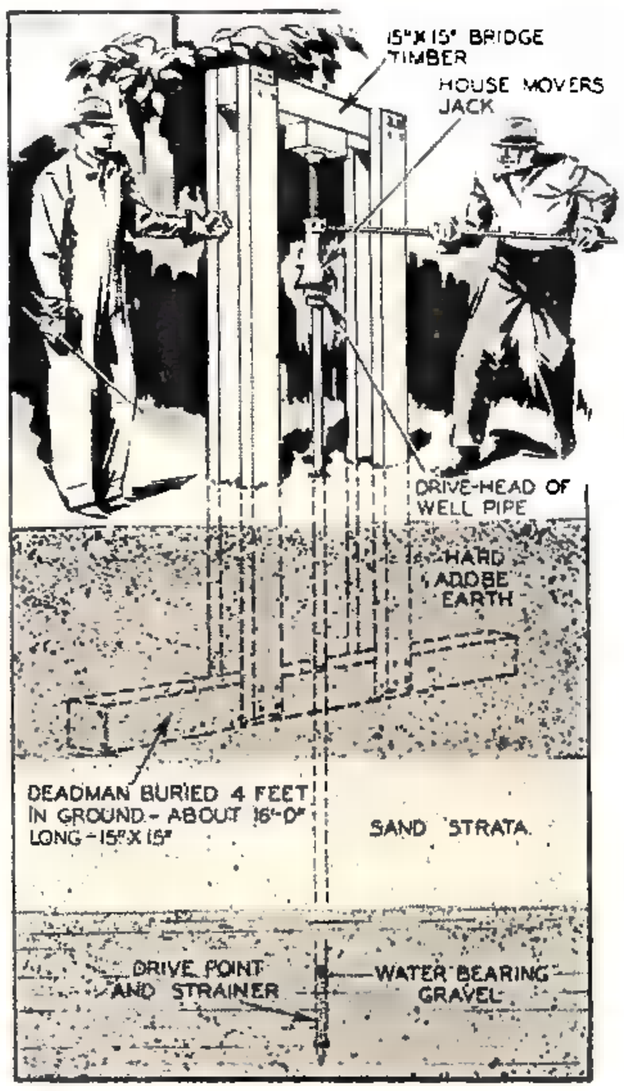
This simple wavemeter permits an accurate check of the transmitter's frequency. It consists of a 5' long by ⅜' wide copper strip, mounted on a baseboard with stand-off insulators to form a "U" shape.





This schematic diagram indicates the utter simplicity of the transmitter's circuit. The tuning inductance is wound with No. 18 enameled copper wire as shown in inset. The choke coil is wound with No. 32 d.c.c. wire on a ¼" Bakelite dowel. The antenna radiators, which mount to the stand-off insulators, each measure 7¼"x⅜".

NEW IDEAS FOR HANDY MEN



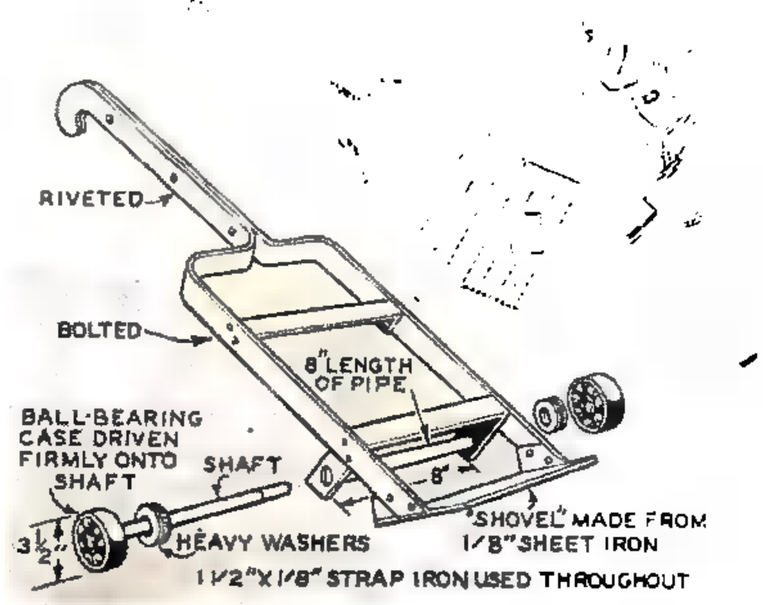
Heavy Duty Jack Drives Water Wells

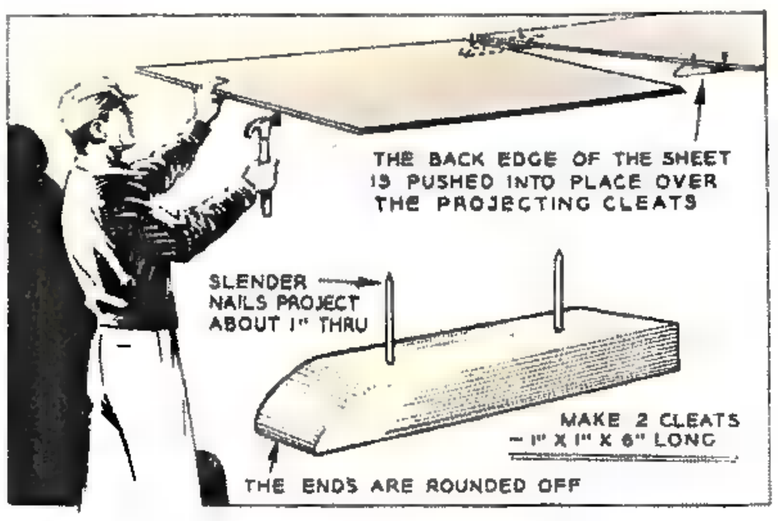
THE drilling of wells, without the use of the usual elaborate well driving equipment, can be accomplished, without difficulty, by employing a heavy duty truck or house movers jack and several sturdy bridge timbers. Assemble the bridge timber so as to form the driving rig and bury the lower portion in the ground to a depth of 4 feet.

In assembling the rig, make certain that the construction is thoroughly rigid. To accomplish this, fasten all timbers together with large carriage bolts and draw them up tight with a wrench having an ample amount of leverage. When a location has been decided upon, for the well drilling operation, set up the rig by digging a trench 4 feet deep, inserting the 16-foot by 15 by 15-inch deadman in the pit and refilling it with dirt. A hole in the center of the deadman serves as a guide for the pipe. To use the drilling rig, feed a length of pipe through guide hole and force down with jack, adding additional sections of pipe, until water is struck.

Dolly Built From Odds And Ends

A FREIGHT dolly that will find many practical applications in the home workshop can easily be built from strap iron, fashioned into a frame similar to the one in the accompanying illustration. A pair of ball bearing casters provide the rolling stock. A sheet iron plate attached to the front of the frame permits easy loading of heavy objects.—T. L. Moore.



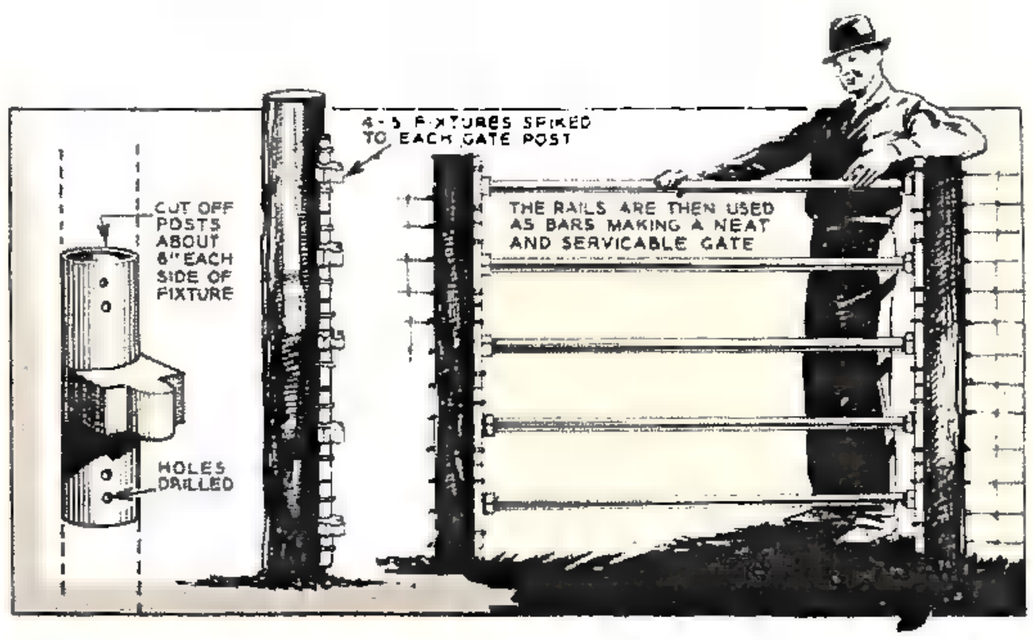


Wallboard Installation Simplified

OVERHEAD wallboard installations can be made a one man operation by using wooden cleats for holding the board in position while it is being nailed in place. Make the cleats 1-inch square by 6-inches long, rounding off one end so that when the cleat is fastened to the ceiling, the wallboard can easily be slipped under it.—A. H. Waychoff.

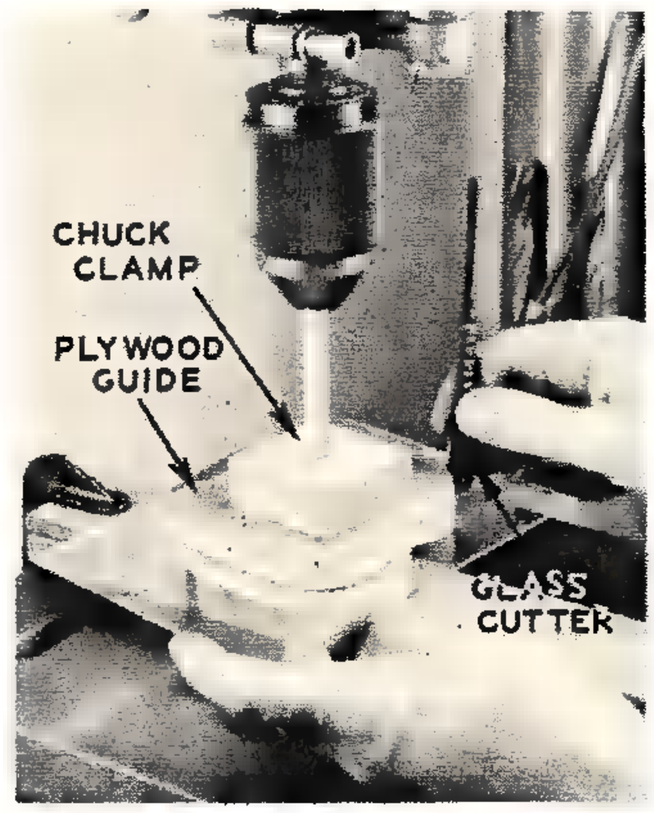
Bed Rails Form Gate Bars

FARMERS who are seeking a practical gate closure for pasture land will find this stunt worth while. Bed rails, which are not difficult to obtain, are hung across the fence opening and fitted into the original bed rail fittings so that once in position, it is impossible for live stock to stray. Install the bed rail fittings to each side of the fence opening with spikes, spacing them accordingly.—A. H. Waychoff.



Kinks That Simplify Shop Tasks

Drill Press Clamp Aids Glass Cutting



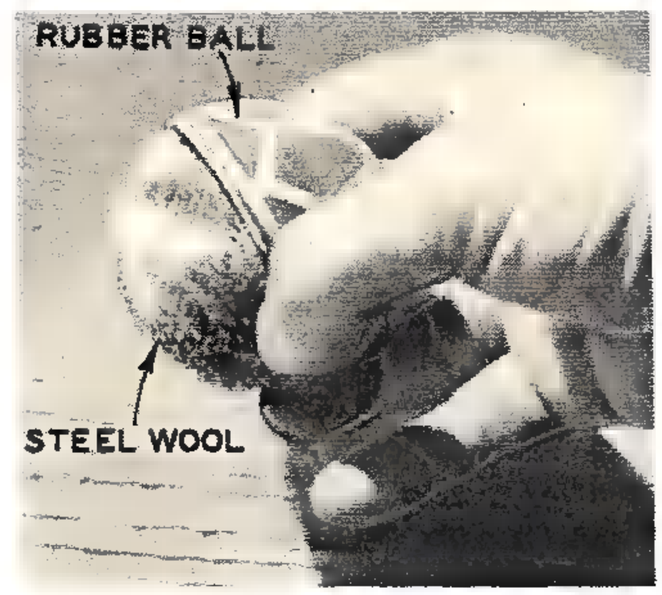
WHEN cutting glass into intricate shapes, the use of a drill press as a clamp for holding the glass in a firm position during the cutting operation, makes the task a simple one. Fit the drill press chuck with a dowel to which has been attached a small block of wood. The size of the dowel is not important, although one of ⅜-inch diameter is recommended. Fasten the small block of wood to it by drilling a hole in the center and gluing in place. Cut a plywood pattern to the exact shape to which the glass is to be cut and place this over the glass pane in the manner shown. The chuck is then lowered and pressure applied to the drill lever so that the glass can be scored accurately with a glass cutter.—K. Murray.

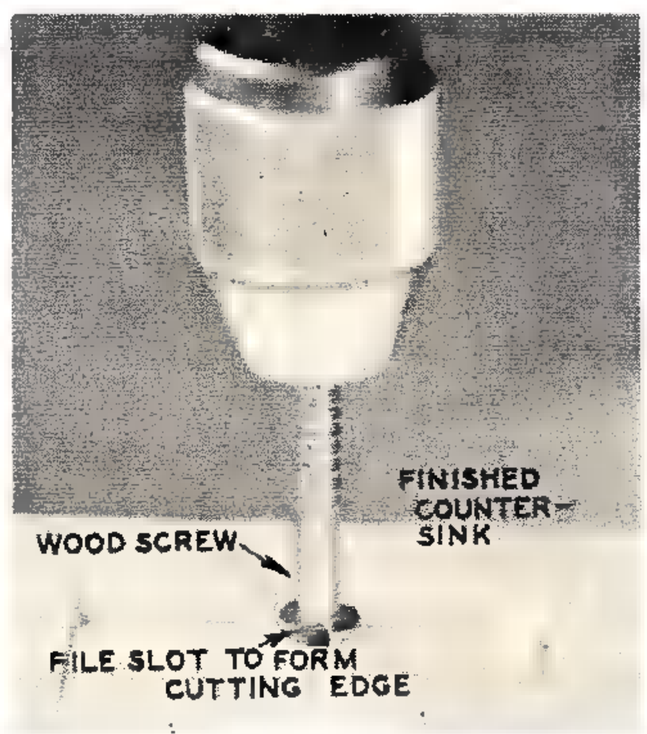
Rubber Band Protects Brush Bristles

AN OBJECTIONABLE feature common with most brushes having long bristles is that they spread paint over too large an area so that it is impossible to use them when painting in corners or other close places. A simple way to overcome this disadvantage is to slip a wide elastic band over the bristles, adjusting it to the most satisfactory position for the particular painting operation in which it will be employed. The paint brush can be used, instantly, for painting large surfaces by slipping off the elastic.—E. Novak.

Rubber Ball Forms Steel Wool Holder

MANY have experienced painful, if not serious, sores from small particles of steel wool sticking in the fingers when this material was used for smoothing or polishing metal surfaces. An excellent holder for steel wool pads can be made by cutting a rubber bouncing ball in half and stuffing it with the metallic polishing material. One five-cent ball will make two holders for taking two different grades of steel wool. —Emil Novak.





Wood Screw Makes Handy Countersink

A LARGE wood screw can be converted into a serviceable countersink that will cut keen screwhead recesses in woodwork in no more time than required to do it with the usual countersink bit. Select a screw, of moderate size, having a round head and, with a triangular shaped file, file it down at the slot to form a cutting edge. After filing away part of the metal from opposite sides of the screw slot, as shown in the accompanying illustration, heat the screw until it becomes a dull red, then plunge it into cold water. To prevent the screw threads from damaging the jaws of the drill press chuck, file off all sharp edges.—Kenneth Murray.

HOME

This looks like a cozy log cabin in the mountains, with the owner's car ready outside the door to take him to town. Actually, this is a "table top" shot. The cabin is a cleverly-made model of lollypop sticks and cardboard, and the flashy roadster is a rubber toy purchased for a dime in a chain store!

This realistic lake scene will fool many people. The plane really flies, but it is only about a foot long! The placid "lake" is a mirror; the shore is beach sand; the "trees" are tiny twigs from window plants. An excellent example of ingenuity and good photography made with an ordinary hand camera.

As almost every motion picture goer knows, the Hollywood studios are continually fooling us these days with scenes photographed in miniature, such as a village street, rural winter snow scene, a ship at sea, an airplane wreck and what not else. So cleverly are these miniature "sets" designed and photographed that in the picture their lack of reality defies detection, and when we are let in on the secret, we do not mind at all. Indeed, we admire the achievement.

Have you ever tried creating miniature scenes yourself and photographing them with your own camera? It's fun. Depending upon your skill, artistic ability and the materials you employ, you may construct and photograph miniature sets in your own home that will rival the semblance of reality achieved in Hollywood; or, if you prefer, you may create scenes of fantasy, comedy or burlesque to compare with a "shot" in an animated cartoon.

For a "still" camera, this is really nothing else than table-top photography, such

CAMERA STUNTS

These elephants must have heard of the song "Kitten on the Keys" and decided they'd try a tune themselves. A simple but effective home-camera stunt, made by the light of a single flood lamp in a reflector.

as has long been practiced by amateurs, but which now is photographically much easier for the amateur than it used to be, because of the recent introduction for home use of more powerful artificial lighting. For table-top photography you can very cheaply, with two or three of these brighter home flood light bulbs, rival the lighting equipment of Hollywood studios, and, what is more, do good work with an inexpensive fixed-focus camera, provided you use a portrait attachment to secure the necessary close-up focus.

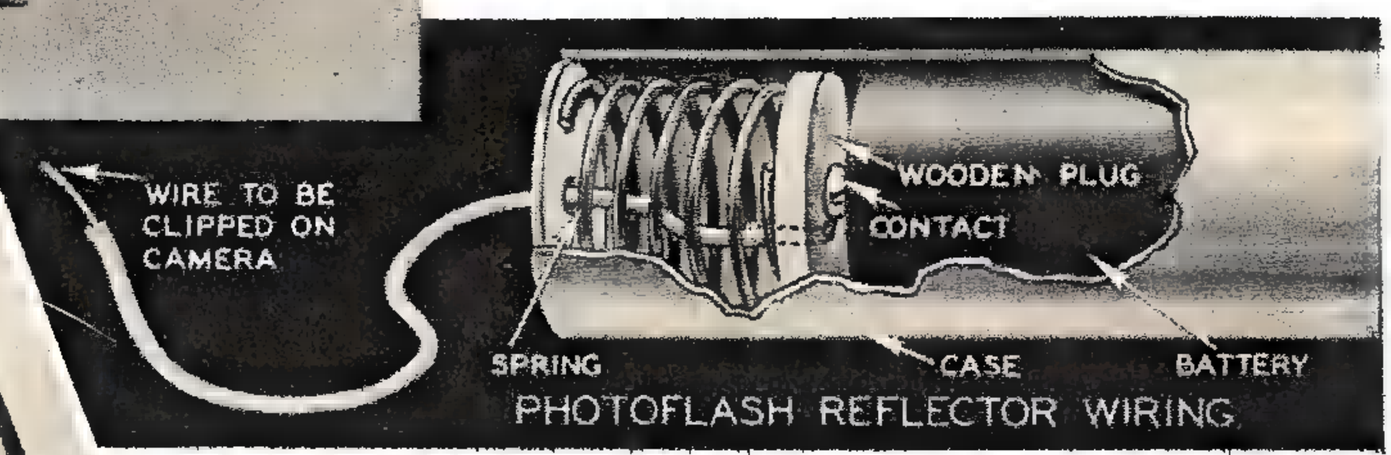
Constructing one of these sets requires, of course, a certain amount of time and patience, with the expense depending upon the materials you put into it. Very amusing scenes may be created, however, with-

[*Continued on page* 142]

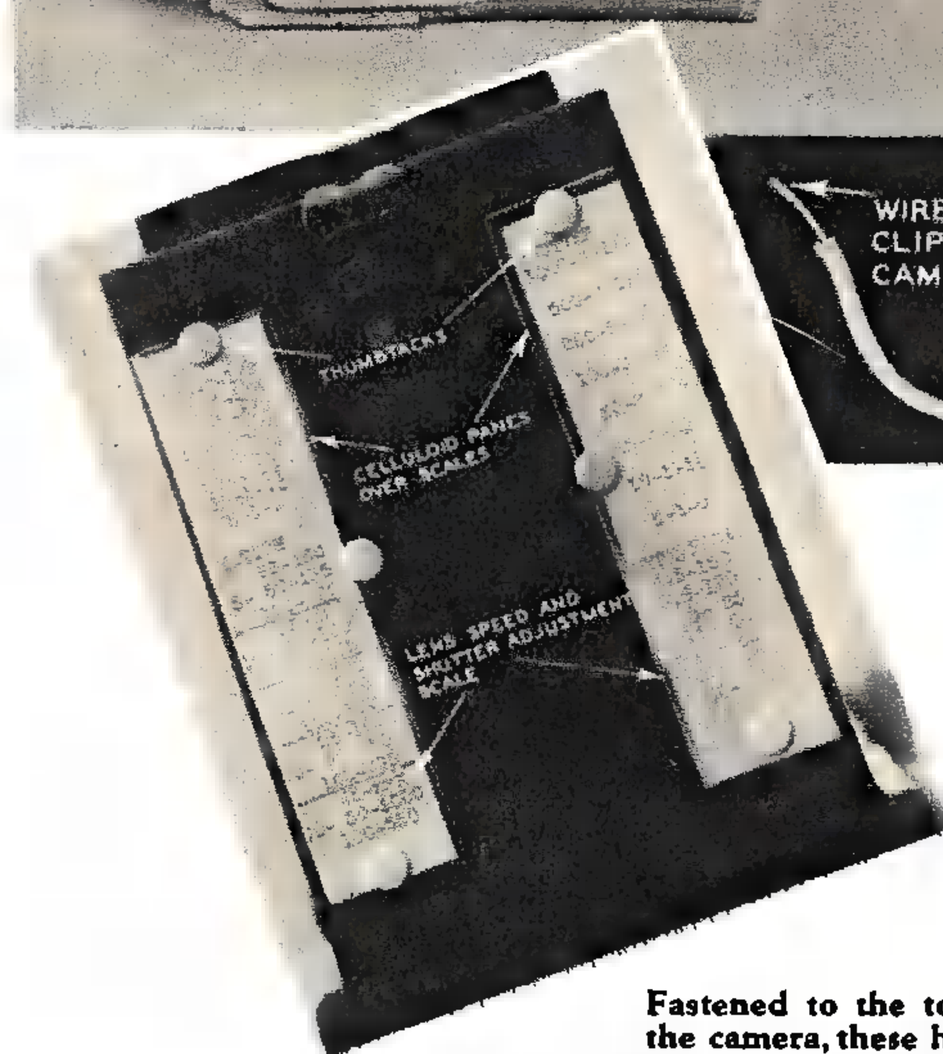
An amateur photographer-entomologist raided his specimen jars for the "props" for this weird scene, which represents a "Grasshopper Night Club." Note the "fan dancer" performing for amusement of assembled guests. Specimens are held temporarily in place by specks of rubber cement.

Modernizing

This metal indicator permits distances to be inscribed on focusing knob for instant adjustment, eliminating use of camera's focusing screen.



A small toggle switch mounted on the side of the Graflex permits right hand to trip "photoflash" and left hand to snap shutter. The "photoflash" holder is made from flashlight case as described above.



Fastened to the top of the camera, these handy exposure data cards insure successful "shots"

by Everett Rudloff

DESPITE new and clever cameras of all shapes, sizes and prices, there are thousands of camera addicts who have used the time-tried Graflex with great success. With some frequency, however, they would like to make it still more useful. Many photographers build their camera equipment around a Graflex, adding other machines for special work from time to time, but falling back on the "old reliable" for their important shots.

It is this kind of work which has inspired some of the "Graflex gadgets" described here.

First in importance, because it may save the cost of the camera, is a neck strap. Neck straps are not new, except on a Graflex. Miniature cameras come equipped with the straps so that the camera may be carried at chest level all the time. While no one would choose to carry a heavy camera in that position constantly, there are occasions in news and commercial work when it is helpful to be able to let go of the camera and have your hands free.

To make this strap, secure from the five and ten-cent store one web strap three feet long, two swivel snap hooks, such as are used for dog chains; two brass reinforcing strips, one inch long, and two half-inch screws. Run the plain end of the strap through the buckle and rivet it over one of the hooks. Find the

Your GRAFLEX

Simple gadgets that bring this efficient news camera up to date.

A neck strap, such as this one, permits more freedom of the hands when using the Graflex for news and commercial work. The strap, a 10c web type, is fitted with swivel snap hooks for fastening to camera box connectors.

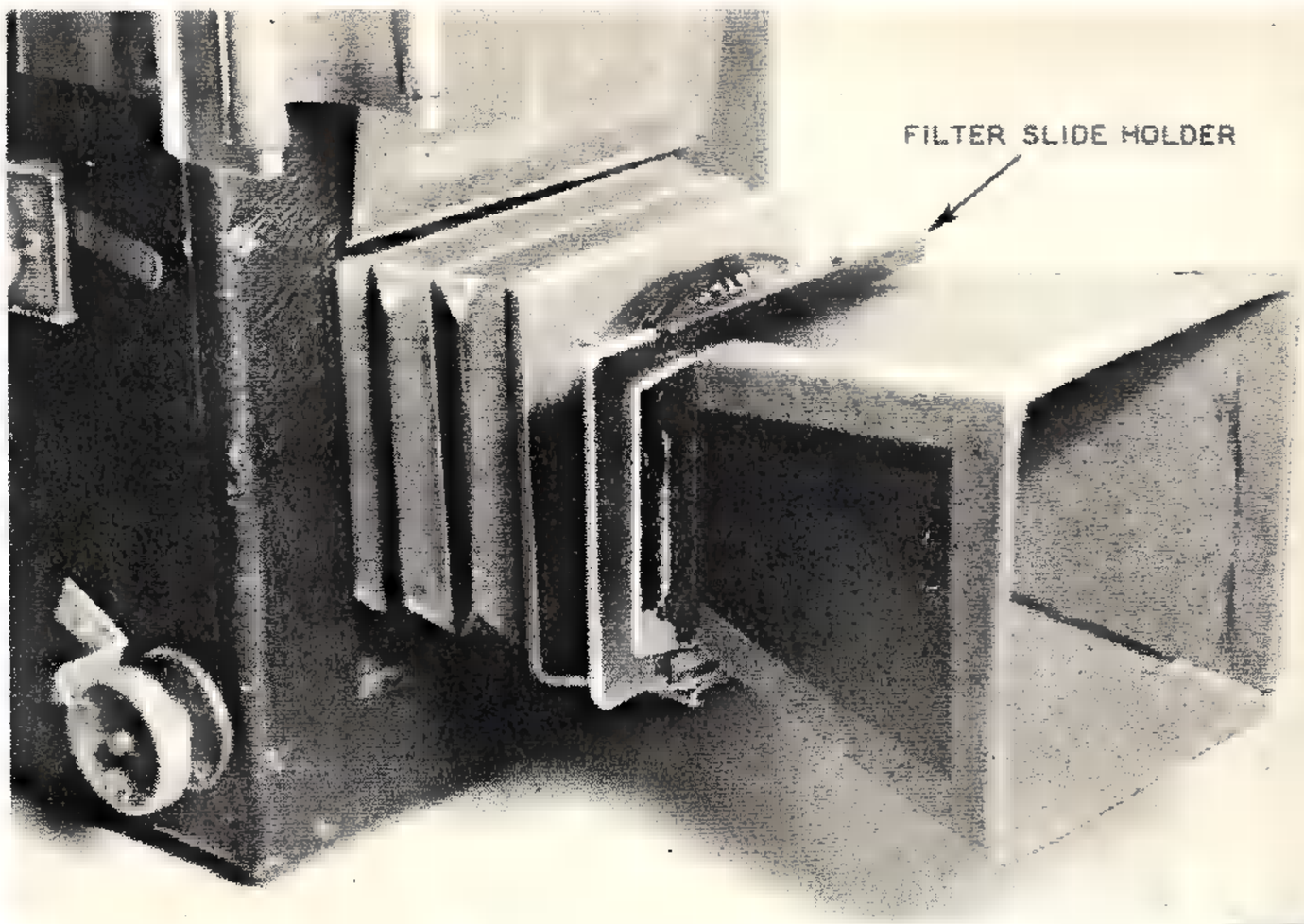
mid-point of the camera case and fasten one brass strip on each side, with one screw, so that the other hole in the strip projects above the camera box, then ream the other holes to take the strap hooks.

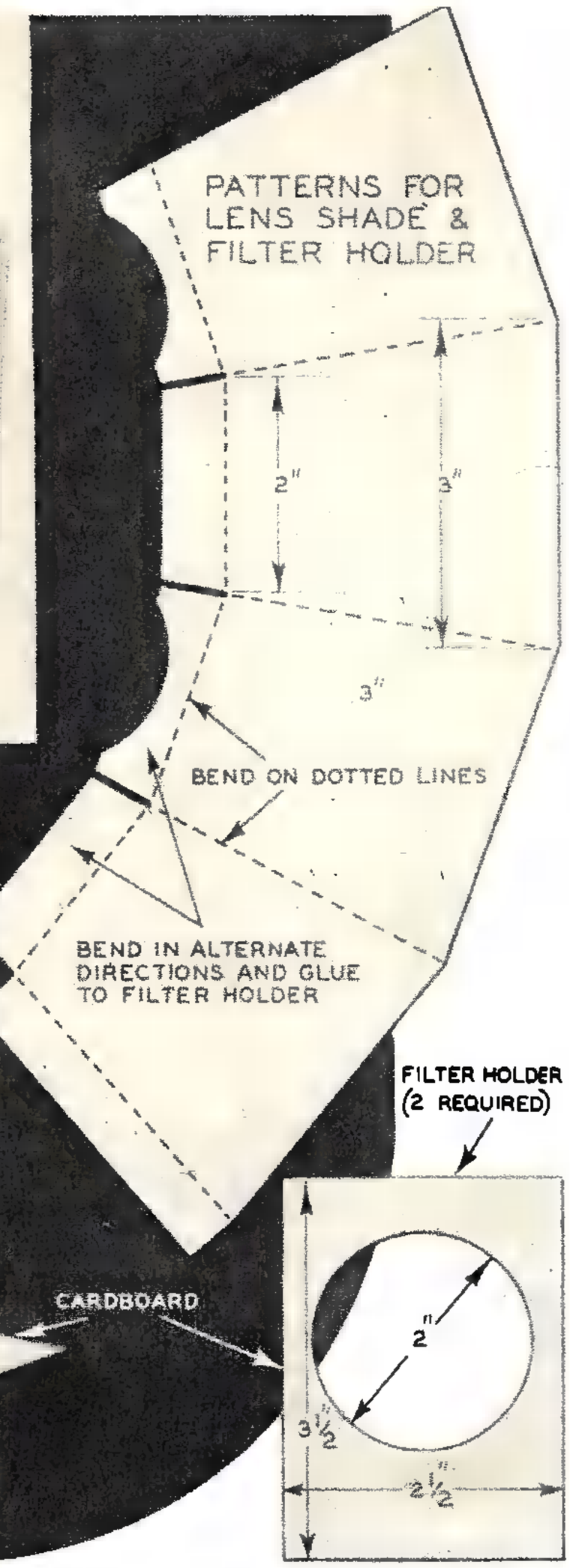
To use the strap, open the camera to working position, snap the left hook, bring the strap around the neck and snap the right hook in position. Now, adjust the strap length with the buckle so that when using the camera in normal position the hands take the weight as usual, the neck strap being allowed just a little slack. When not in use, the strap is carried in the pocket and the two brass strips swung down along the body of the camera.

A focusing scale is a real necessity, yet few popular Graflex models have one. The ground glass is ideal for most pictures, but there are times when the light is bad, the lens is stopped way down or a night picture with photoflash is necessary and it is impossible to see the image in the hood.

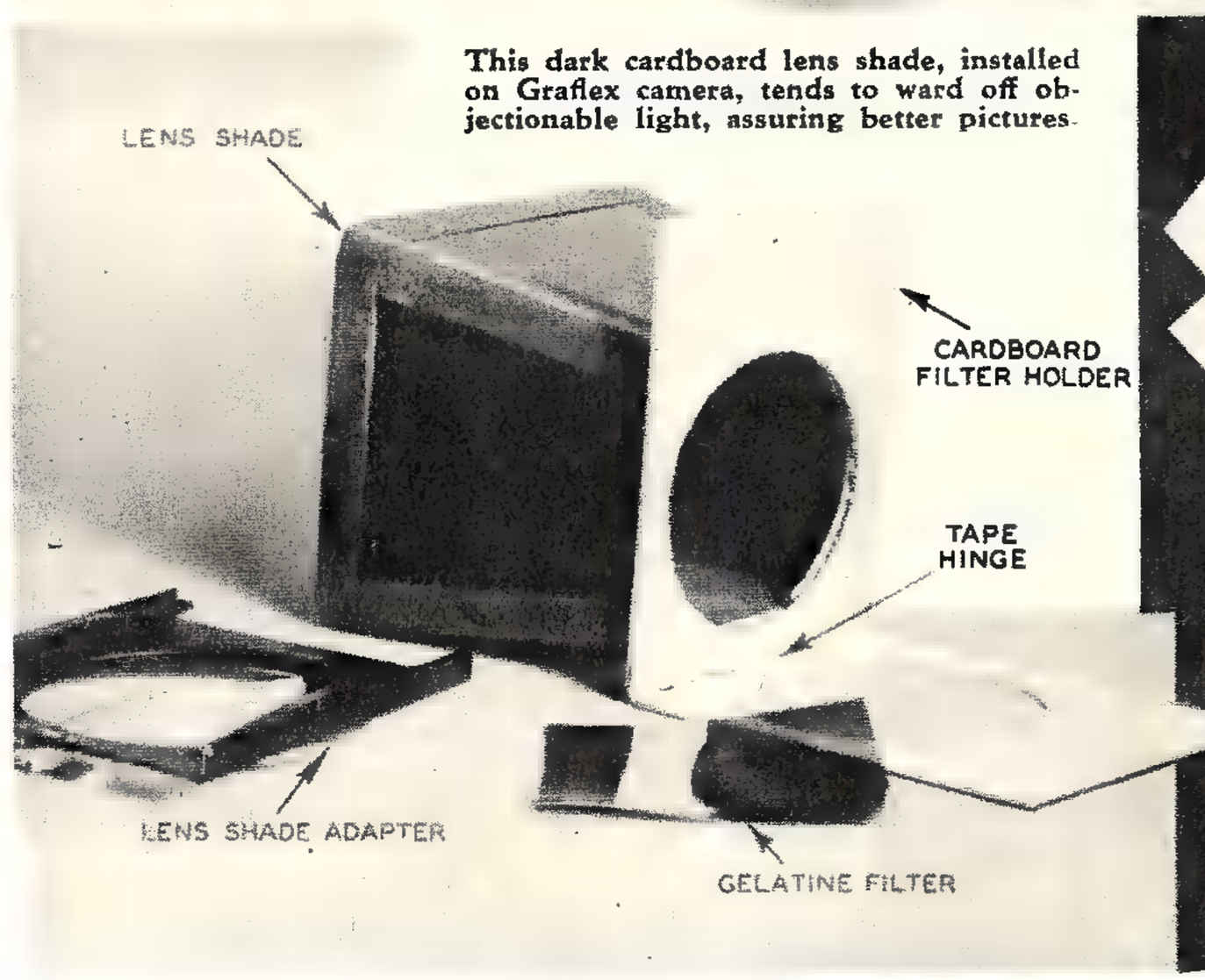
An accurate focusing scale is provided by making a metal pointer for the regular focusing knob and screwing it to the camera at a 45 degree angle with the bottom and front of the box so that the pointer just clears the knob. The camera is then taken outdoors and a target set up on a support. With a lens of 6½ inches focal length the following distances were measured off: 4, 5, 6, 7, 8, 12, 15, 20, 30, 45, 60, 85 feet and infinity.

With the lens over the 4-foot mark and





This dark cardboard lens shade, installed on Graflex camera, tends to ward off objectionable light, assuring better pictures.



A lens shade, for preventing extraneous light from striking the Graflex lens, can be made from cardboard, cut according to the above template and assembled with "scotch" tape. The rear of the shade is fitted with a holder into which can be inserted colored gelatine slides when unusual effects are desired.

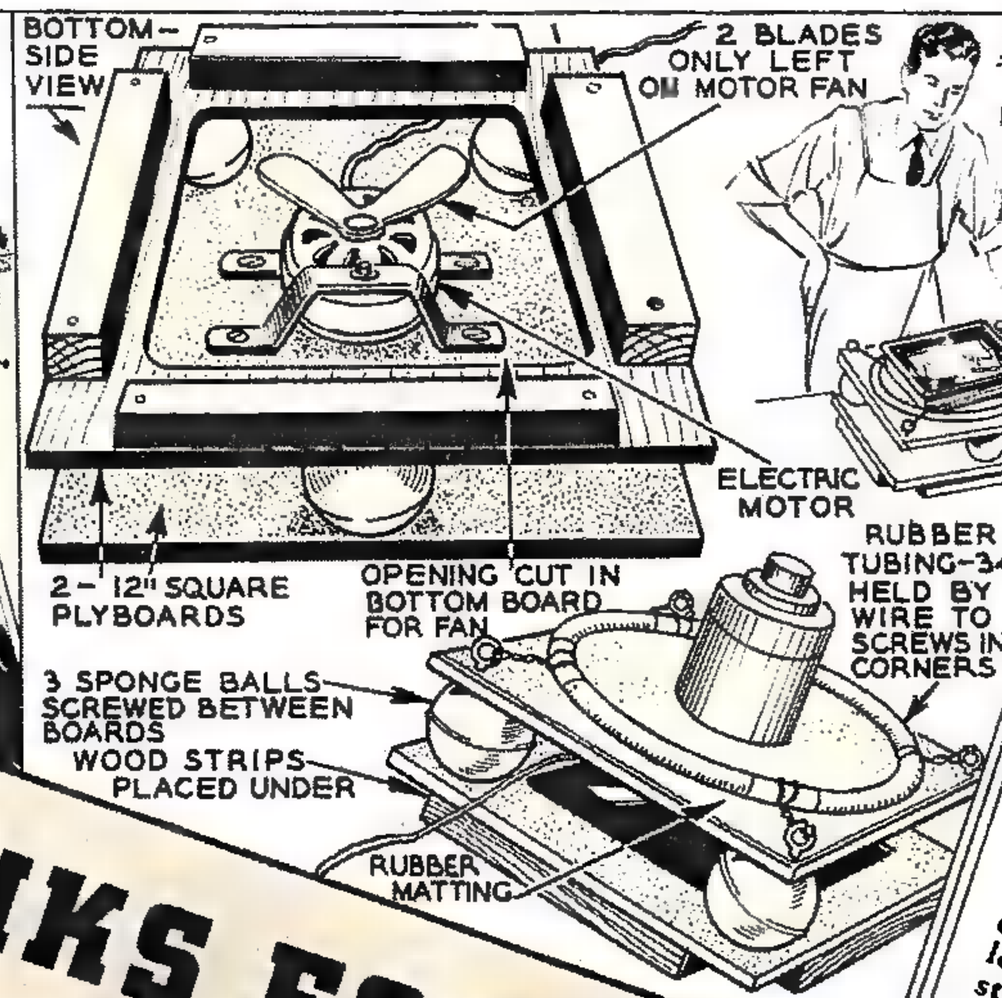
wide open, turn the focusing knob clockwise until the target is needle-sharp on the ground glass. Now, with the knob in that position, make a scratch mark on the knob opposite the pointer and label it "4." Do the same with the camera five feet from the target and so on. Always make the scratch mark when the knob is turned in a clockwise direction with a slight tension being exerted against the focusing mechanism. This will take care of the backlash present in most of these cameras and will insure that when the camera is later focused to a predetermined setting and the reading taken while the clockwise pressure is being exerted on the knob, the setting will be accurate. With the series B Graflex and a 6½-inch lens, the range from four feet to infinity is covered in slightly less than one complete revolution of the focusing knob.

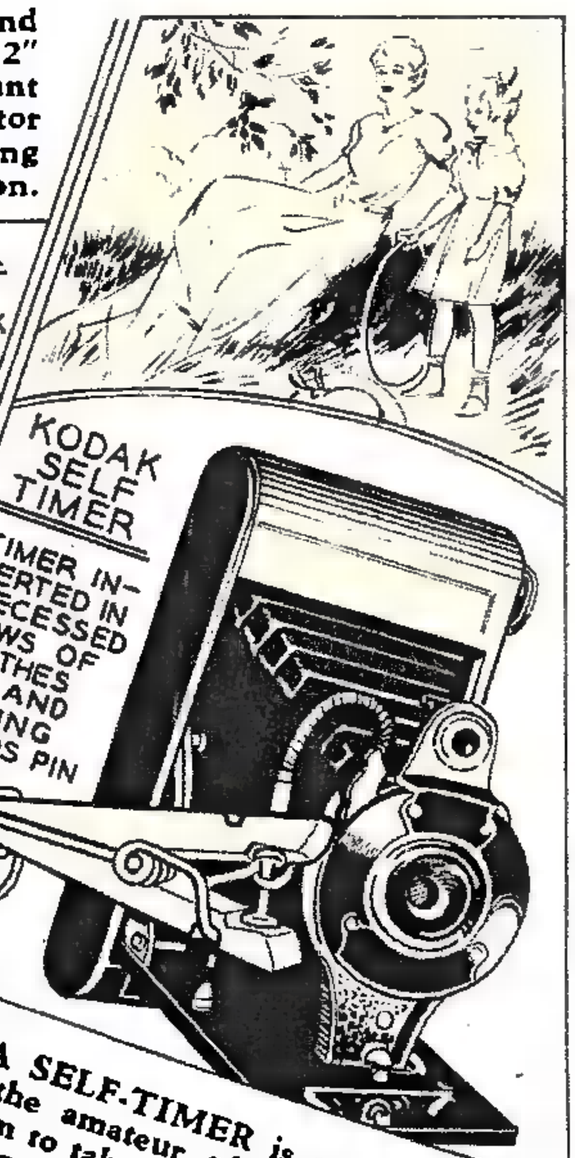
On the top of the camera, next to the handle, are two places ideal for exposure data, typed on cards and protected by celluloid envelopes. At the top of each card are the shutter settings for the most common speeds, which saves turning the camera end for end to find the regular shutter speed table on the front of the hood. On the left hand table, at the bottom, are the speeds necessary to stop motion at various distances. The left figures are miles-per-hour, the middle

[*Continued on page* 128]

KINKS FOR CAMERA FANS

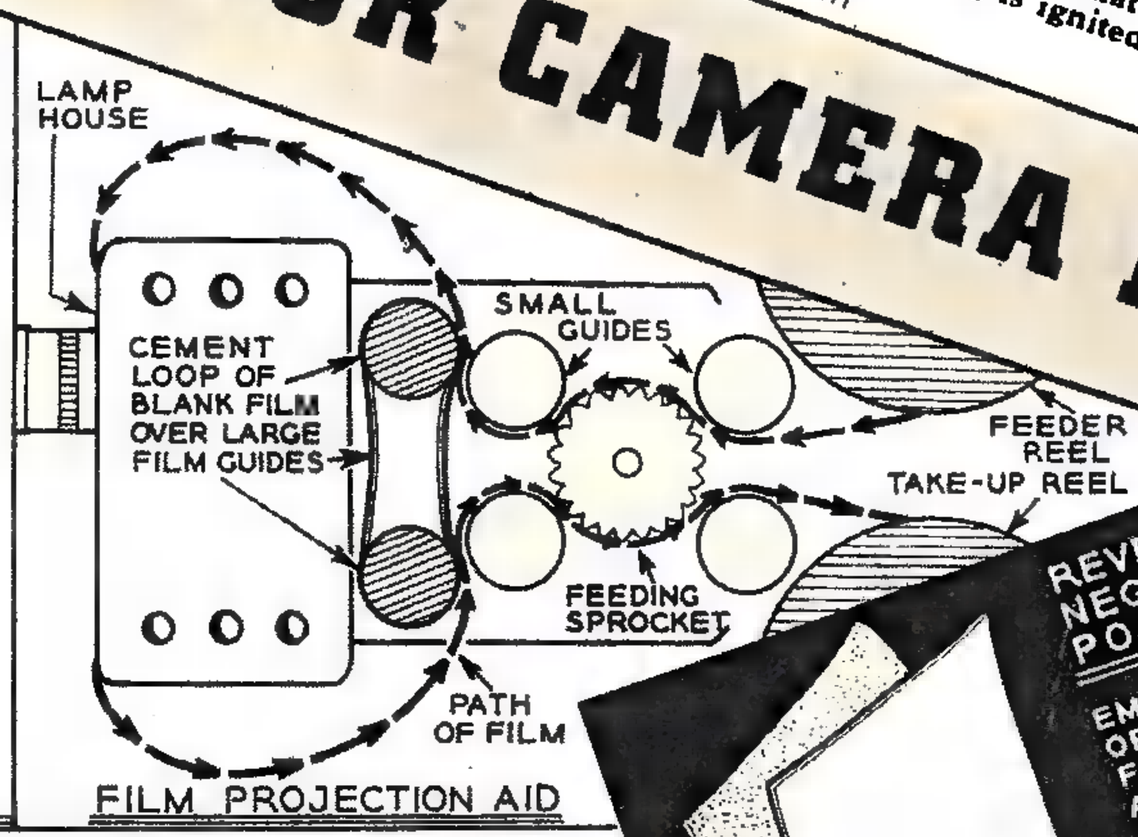
PHOTO DEVELOPING AGITATOR insures proper development of both negatives and prints. Secure an old electric fan, remove two of the blades and mount it to a 12" by 12" plywood panel, as shown below. To each corner attach a sponge rubber ball and then mount the assembly on an elevated mounting so fan blades are free to revolve. Complete the agitator by fastening rubber tubing guide around top panel. Insert the film in a daylight developing tank, then place on the vibrating panel, so as to receive proper and thorough agitation.

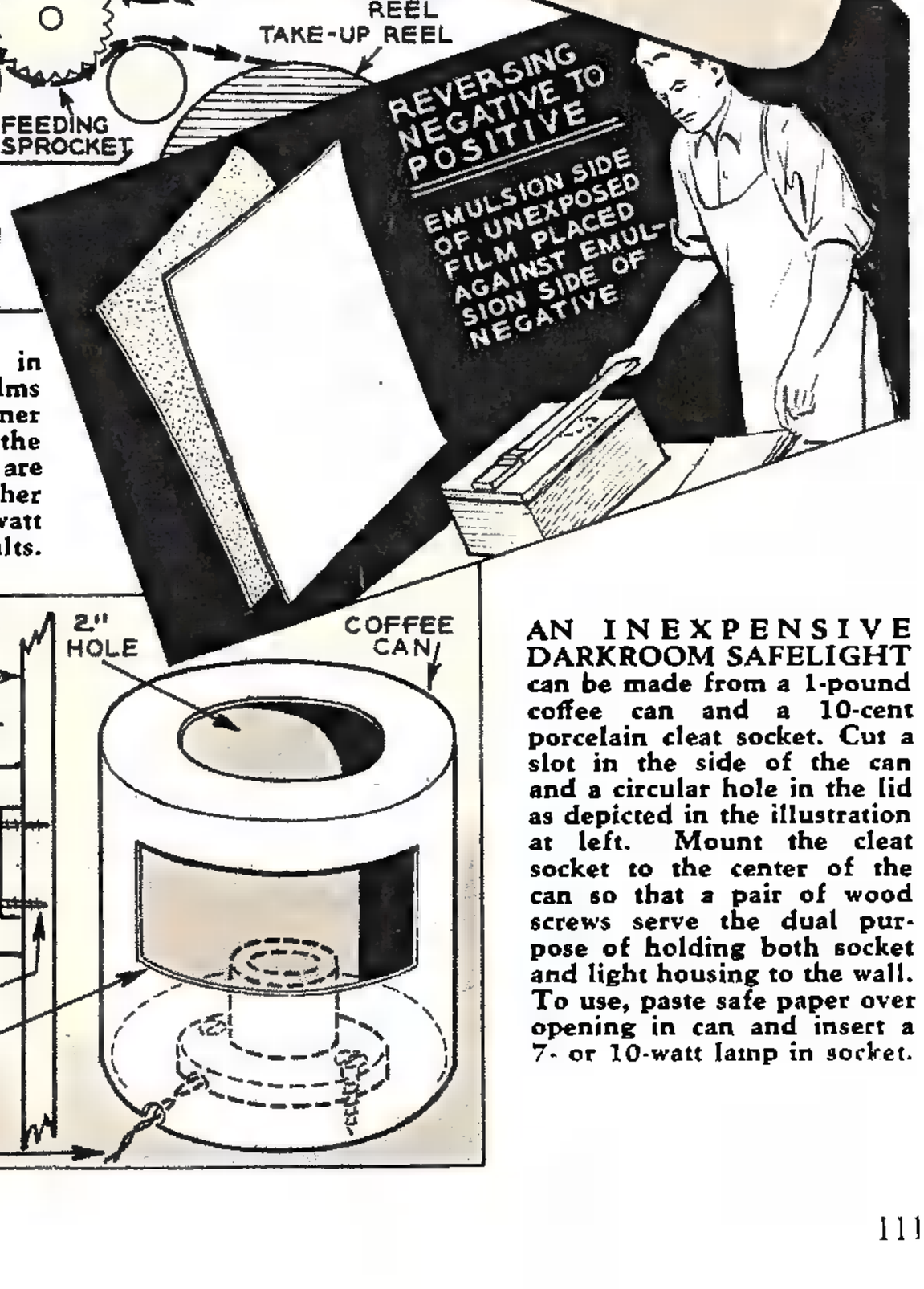




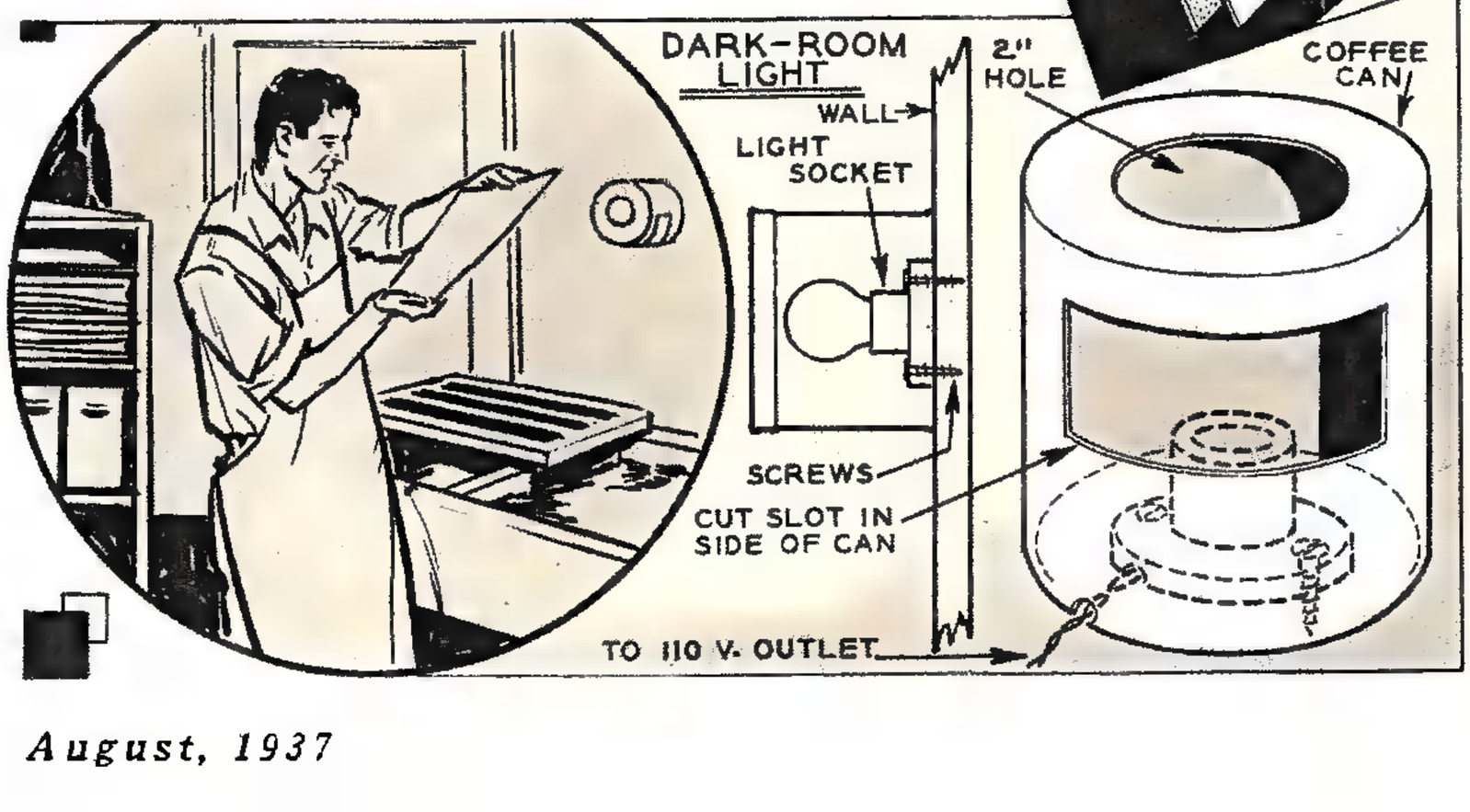
CAMERA SELF-TIMER is a useful accessory for the amateur photographer, for it permits him to take his own picture. Secure a spring type clothes pin and cut a slot in one of the jaws for inserting the shutter release plunger. Tie the clip with waxed string so that jaws remain open. When string is ignited jaws close and snap picture.

FILM PROJECTION GUIDE prevents 16 mm film from jumping off the sprockets of the framing mechanism. The guide is formed from a length of scrap film looped over the sprockets, as indicated at right, and cemented together at the ends. The movie film is threaded through the projector sprockets in the usual manner.

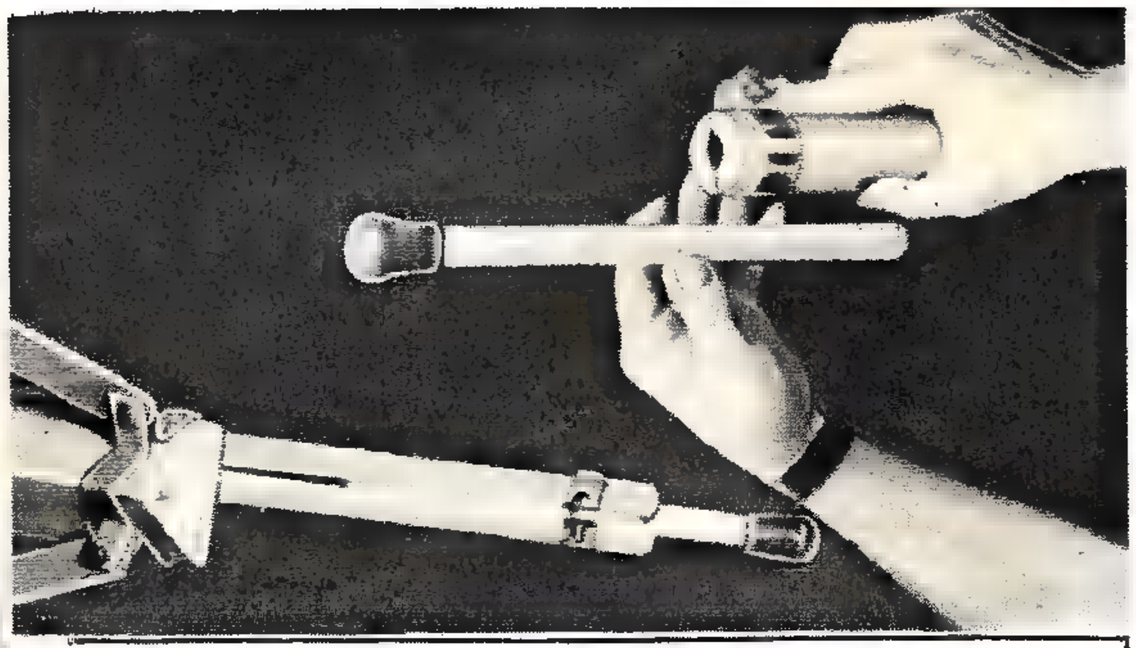




MAKING POSITIVE FILMS FOR PROJECTION in slide lanterns is a kink well worth knowing. Positive films are made from the ordinary negative film in the same manner as a positive print. Cut up a roll of unexposed films, in the darkroom, to the size of the negatives from which prints are to be made. Place the emulsion side of both films together and expose in printing frame for 1/10 second. A 10-watt lamp is recommended for obtaining most satisfactory results.

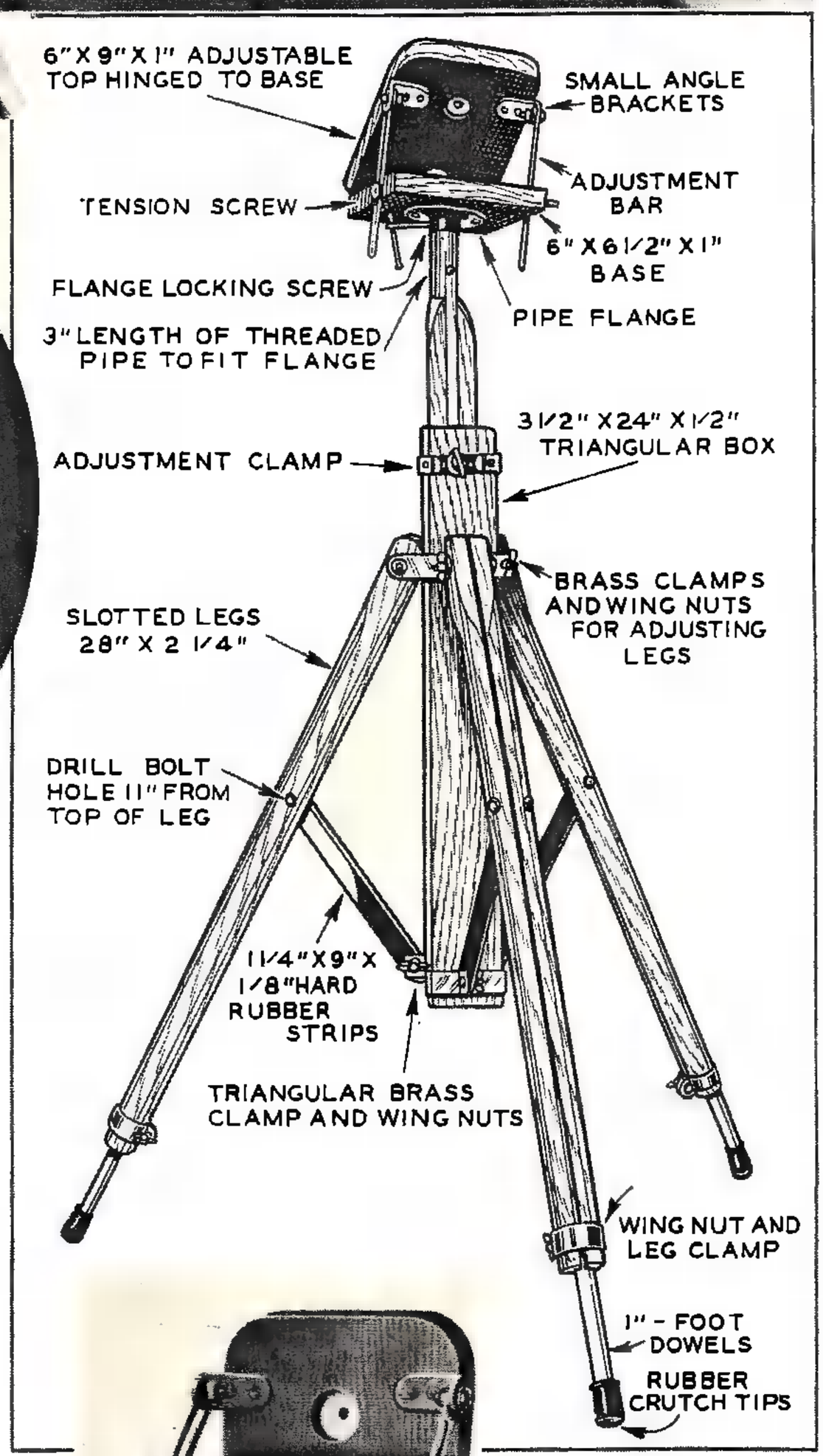


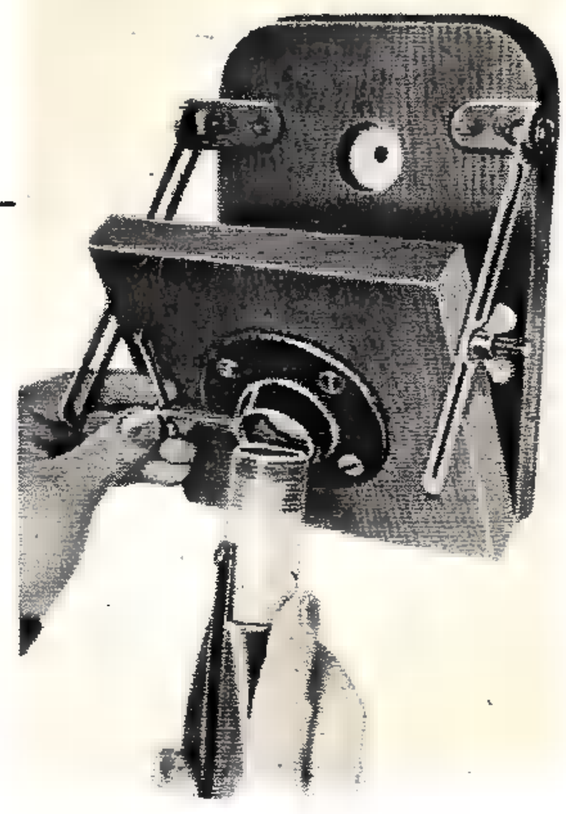
AN INEXPENSIVE DARKROOM SAFELIGHT can be made from a 1-pound coffee can and a 10-cent porcelain cleat socket. Cut a slot in the side of the can and a circular hole in the lid as depicted in the illustration at left. Mount the cleat socket to the center of the can so that a pair of wood screws serve the dual purpose of holding both socket and light housing to the wall. To use, paste safe paper over opening in can and insert a 7- or 10-watt lamp in socket.



ALL-PURPOSE CAMERA STAND

by Ralph T. Moore





The photographic illustrations, at top, show assembly of the leg hinges and the manner in which adjustable leg dowels are installed. Details of the stand are given in perspective form to simplify construction. At left is shown the completed tilting top of the tripod.

FOR those who use the larger size cameras, an ordinary tripod is many times inadequate and an unstable support. This is especially so when a quick shot is necessary indoors.

Here is a simply designed, sturdy and quickly adjustable stand that most photographers will find to be an answer to camera mounting problems. Many similar designs may be purchased, but by following this construction costly fittings are eliminated and only materials universally available are employed in the construction.

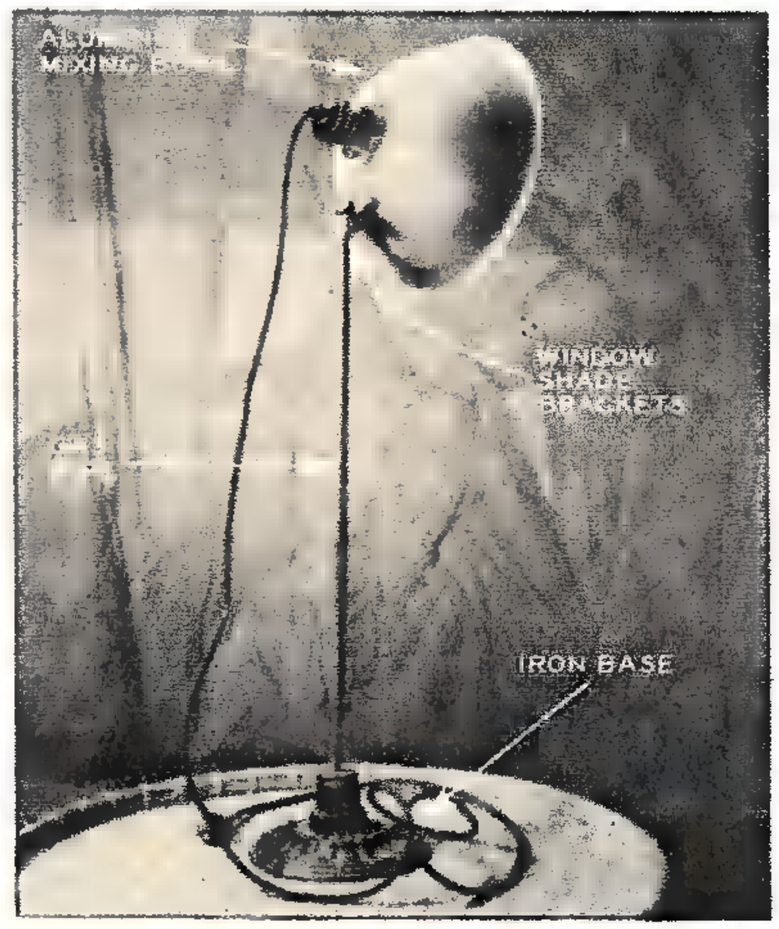
Make the wooden parts first, beginning with the stem. This is a triangular shaped box, made from hard stock. Ash and spruce are satisfactory woods to use, but mahogany makes a more beautiful job if such is preferred. Three side pieces, each 3 by ½ by 24 inches long, are required. Plane or saw the pieces at 30 degrees on both edges to form alternate laps at the corners as shown. Using hot glue and finishing

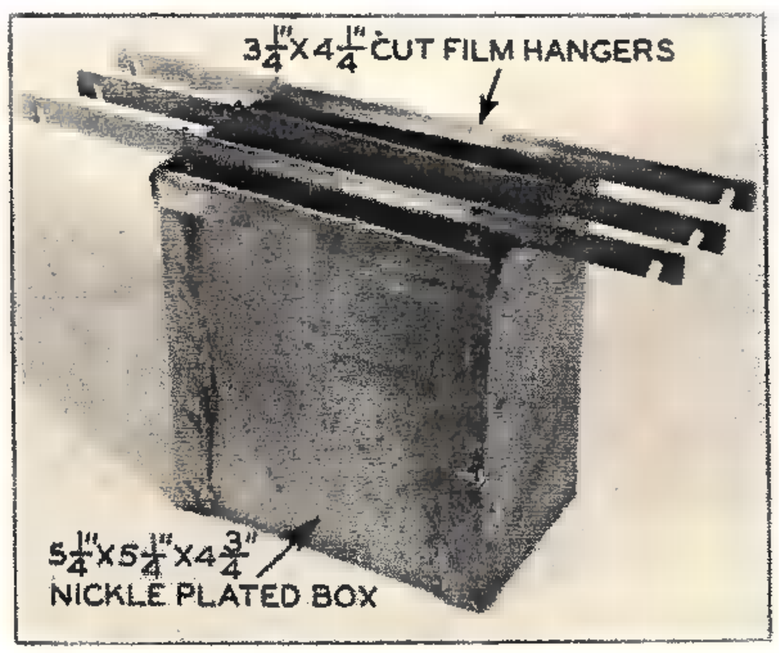
[*Continued on page* 138]

Short-Cuts For The Amateur Photographer

Homemade Floodlight Built For 30c

A LARGE tin or aluminum mixing bowl, two window-shade roller hooks, a 3-foot length of ¾-inch gas pipe and an iron base, salvaged from an old display stand, provide the major materials for building this handy floodlight reflector and stand. Cut a hole in the bottom of the mixing bowl to allow for the insertion of an extension light socket. Fit a tee coupling to one end of the gas pipe, mounting the opposite end to the cast-iron base. The mixing bowl reflector is attached to the lamp standard by mounting the curtain roller hooks to the bowl with machine bolts. Space the hooks so that they can be slipped over the tee fitting and a long bolt passed through to secure the reflector.—K. F. Keith.



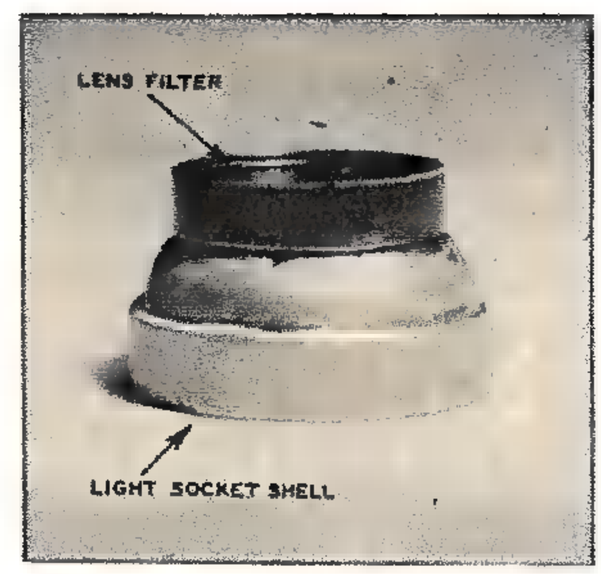


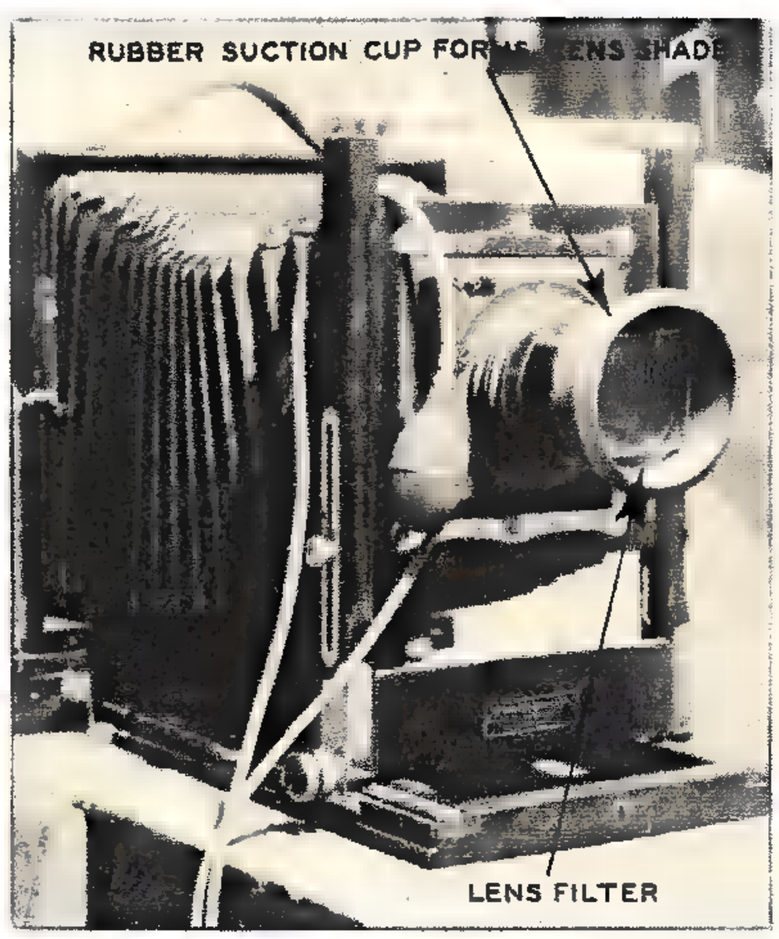
Midget Tank Develops Cut Films

FOR the amateur photographer who rarely develops more than three or four cut-film negatives at one time, this tiny tank permits 3¼ by 4½-inch cut film to be developed in the smallest possible space. Make the tank, 5¼ by 5¼ by 4¾-inches in size, from sheet brass, soldering all seams securely so that they are leakproof, then have a local garage nickel-plate it thoroughly.—A. Dolid.

Lamp Socket Shell Serves As Lens Adapter

A SIMPLE adapter which permits the use of supplementary lenses and filters, smaller than those designed for a camera fitted with 1½-inch lens, can be assembled, in emergency, from the lower portion of a brass light-socket shell. Cut off the threaded stud and enlarge the hole to permit insertion of the smaller lens or filter mounting. Complete the adapter by painting the inside a dull black.—R. Pinault.

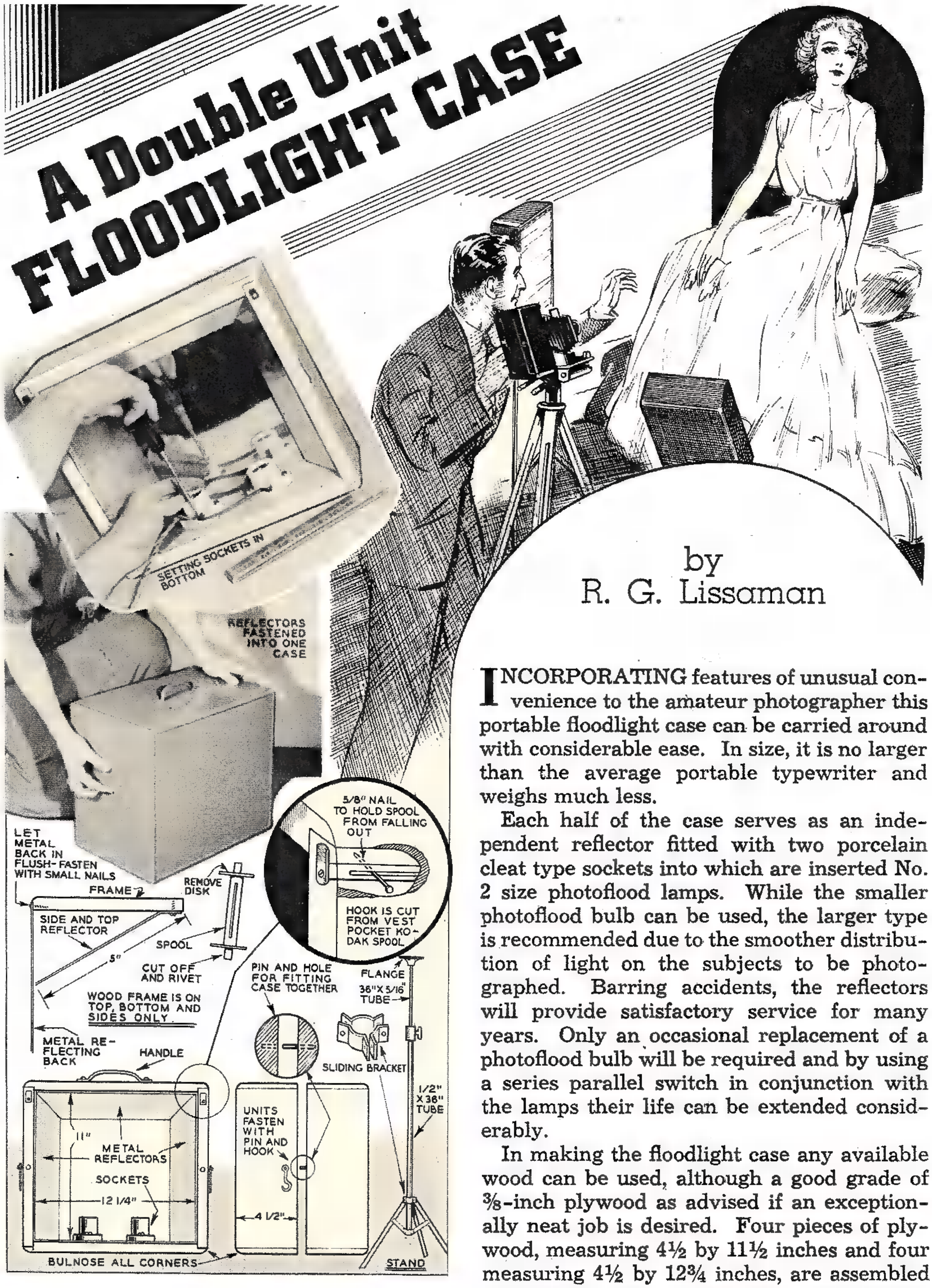




Suction Cup Forms Lens Shade

A LENS shade that will also serve as a holder for light filters is a useful camera accessory that will find many practical applications. The use of a lens shade will result in better pictures, since only the light rays reflected from the object being photographed find their way through the lens. To make this unique shade, purchase a rubber sink drain plunger and cut off the end stud so that it can be forced over the lens of the camera. The expansion on the plunger, where it fits over the camera lens, will close the mouth of the suction cup to a sufficient degree so as to eliminate the possibility of stray light striking the lens. Small light filters, cut from colored glass, can be slipped into the lens shade when special effects are desired.—H. W. Stowell.

A Double Unit FLOODLIGHT CASE



Folding into a compact case, no larger than that of a portable typewriter, this double unit reflector provides the amateur with a very useful accessory. The case is formed from ⅜ inch plywood and lined with aluminum reflecting surfaces. Two No. 2 photoflood lamps are contained in each half of the case. Music stands, from which the racks have been removed and flanges substituted, make excellent tripods for reflector cases.

by
R. G. Lissaman

INCORPORATING features of unusual convenience to the amateur photographer this portable floodlight case can be carried around with considerable ease. In size, it is no larger than the average portable typewriter and weighs much less.

Each half of the case serves as an independent reflector fitted with two porcelain cleat type sockets into which are inserted No. 2 size photoflood lamps. While the smaller photoflood bulb can be used, the larger type is recommended due to the smoother distribution of light on the subjects to be photographed. Barring accidents, the reflectors will provide satisfactory service for many years. Only an occasional replacement of a photoflood bulb will be required and by using a series parallel switch in conjunction with the lamps their life can be extended considerably.

In making the floodlight case any available wood can be used, although a good grade of ⅜-inch plywood as advised if an exceptionally neat job is desired. Four pieces of plywood, measuring 4½ by 11½ inches and four measuring 4½ by 12¾ inches, are assembled to form the sides of the case. Two panels, each measuring 11¾ by 13 inches, form the sides. Before gluing and nailing the case together, run a shallow rabbet along one edge

[*Continued on page* 132]

Stretch out
vacation trails
Yes, siree—you s-t-r-e-t-c-h out your vacation when you ride a 1937 Harley-Davidson. First—it widens your cruising range—takes you to more distant places. Second—its marvelous economy makes your vacation budget last longer. Third—it gets you to more places in less time. And fourth—you have your Harley-Davidson for evening and week-end fun. You stretch your vacation joys over the entire year!
So own a new 1937 Harley-Davidson—and thrill to its zooming speed and surging power! Enjoy its gliding ride and flashing style—its carefree operation—and most important of all the low-cost mileage made possible by its many advanced motor improvements.
See your Harley-Davidson dealer—take a thrilling ride FREE—then ask about his Easy Pay Plans. And send in the coupon—TODAY!
HARLEY-DAVIDSON MOTOR CO., Dept. MM, MILWAUKEE, WIS.
Ride a
HARLEY-DAVIDSON
MAIL THIS COUPON
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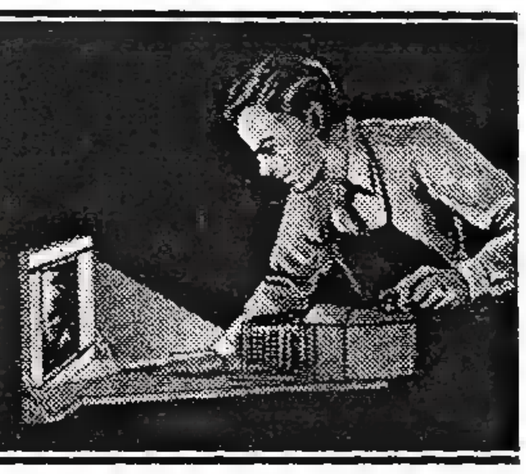
Interested in motorcycling. Send illustrated literature. Postage stamp is enclosed to cover mailing cost.
Name
Address
My age is ☐ 16-19 years, ☐ 20-30 years, ☐ 31 years and up, ☐ under 16 years. Check your age group.

AMATEUR PHOTO PUZZLERS



In this department the Photography Editor will answer any question or problem relating to cameras of all types, enlarging, printing, developing, taking pictures, and the various phases of home movie making. When sending questions to this department, be sure to include a stamped, addressed envelope, so that we can answer directly in case space does not permit publication of the question on this page. Send all inquiries to the Photography Editor, Modern Mechanix, *1501 Broadway, New York, N. Y.*

CAUSE FOR SPOTS ON NEGATIVES

I am just starting to do my own developing and printing. I get clear pictures, but am troubled with tiny spots on the negatives which show up badly on the enlargements. Can you tell me where to look for the cause of this trouble?—J. B. Kane, Bayside, L. I.

First make sure that the inside of your camera is spotlessly clean and free of dust. Wipe it out occasionally with a fine brush.

The trouble is more likely to be with the developing and fixing solutions. Most beginners do not seem to appreciate the importance of filtering these solutions thoroughly each time BEFORE they are used, especially if the negatives are small and enlargements are to be made. A surprising amount of fine sediment will be found in the filter paper or cotton after apparently clean developer or hypo is filtered through it.

Also make certain that the wash water is clean. In many communities the water is full of slight impurities that stick to the soft emulsion of the negative or print. An inexpensive filter that attaches directly to the faucet will help eliminate this possible cause of the "spot" trouble.

DIFFICULTIES EXPERIENCED WITH HOME-BUILT ENLARGER

Although I constructed the "Kitchen Utensil Enlarger," which was described in the May, 1936, issue of MM, according to instructions, I have been unable to secure clear enlargements with it. I have tried a 60, 100 and 150 watt bulb in the device, but still enlargements are not clear. Can you suggest a possible cause for my disappointing results?—Gene Renk, Chicago, Ill.

There are several factors which, if not properly attended to, can lead to unsatisfactory results with the MM photo enlarger. First, it is of especial importance that the lens be in sharp focus before any enlargements are made; with the lens out of focus a clear enlargement is impossible. Before any enlargements are made the lens should be adjusted carefully so as to project a clear image of the negative. Exposure is also very important, and this can only be determined by experiment. If the enlargements are too light, a longer exposure will be required. If too dark, shorten the length of exposure. Keep in mind that the brighter the light used to project the negative, the shorter the length of the exposure. The use of a "Photoflood" bulb in the "Kitchen Utensil Enlarger," and a short exposure, will produce very clear enlargements.

MAKING GLOSSY PRINTS

In drying prints on ferrotype tins to get a glossy finish, I find that many of my pictures are spoiled because the surface is broken up by irregular areas that have not taken the "shine" properly. The ferrotype plates are clean and new.—C. P., Portchester, N. Y.

This "egg shell" effect on glossy prints is a common one. It is due merely to improper contact between the prints and the ferrotype plates. After placing the wet prints on the tins, cover them with a piece of lintless blotting paper or an old linen towel and run over them heavily with a rubber roller. This will squeeze the paper into thorough contact with the surface of the ferrotype plate and prevent the formation of air pockets.

Incidentally, the blotting paper or towel will absorb much of the water on the top of the prints and the latter will therefore dry more quickly.

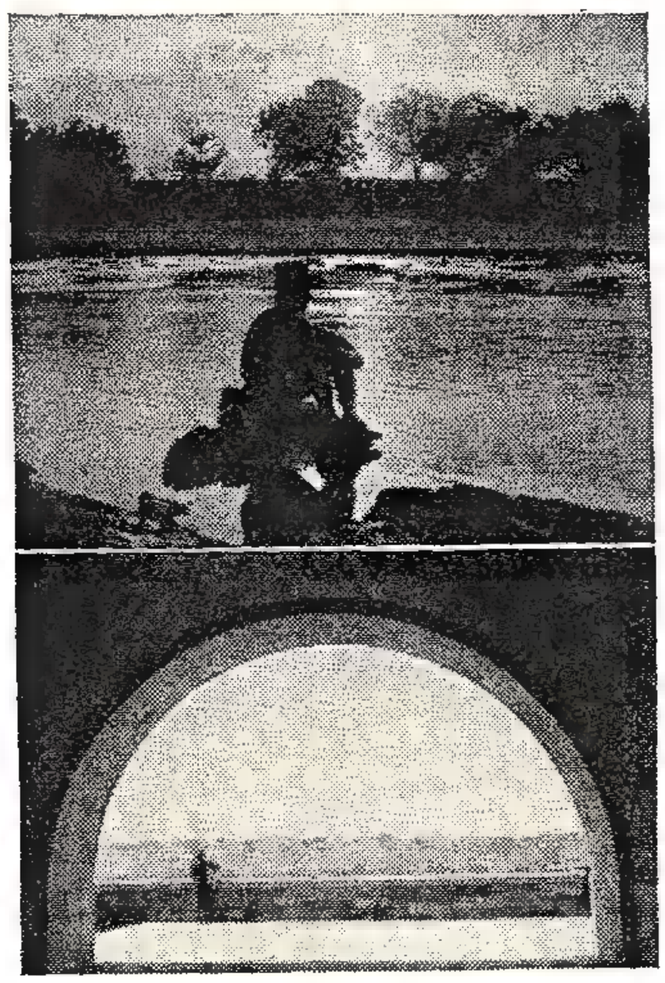
ADVISABILITY OF SHORT STOP BATH

Is it advisable to rinse negatives and prints after removing them from the developer and before putting them into the hypo?—E. Bachner, Richmond Hill, N. Y.

Yes, this is highly advisable. Use ordinary water for negatives, letting them wash for about two minutes. For prints, use a "short stop" bath consisting of 1½ ounces of acetic acid mixed with cold water to make 32 ounces. Swish the prints through this wash for about fifteen seconds and then transfer them to the hypo. This bath can be saved and used several times. Throw it away when the prints that are put in it continue to darken instead of stopping their development instantly.

The value of both the water and acetic acid baths is that they lengthen the life of the hypo and also prevent the likelihood of gas bubbles forming on the negatives or printings. These show up later as black or white pinholes which cannot be removed.

MONTH'S BEST PHOTOS



Beautiful moonlight effects, like the one pictured at top, can sometimes be obtained in broad daylight without the use of filters. This snapshot, which won for Eugene Miller of Ft. Worth, Texas, MM's $5 photo award, was taken directly against the sun and the print allowed to over-develop until the desired contrast was obtained. This month's second award of $3 was received by William McAleer of Woodside, Long Island, N. Y., for his interesting composition photograph, which was snapped through a stone archway.

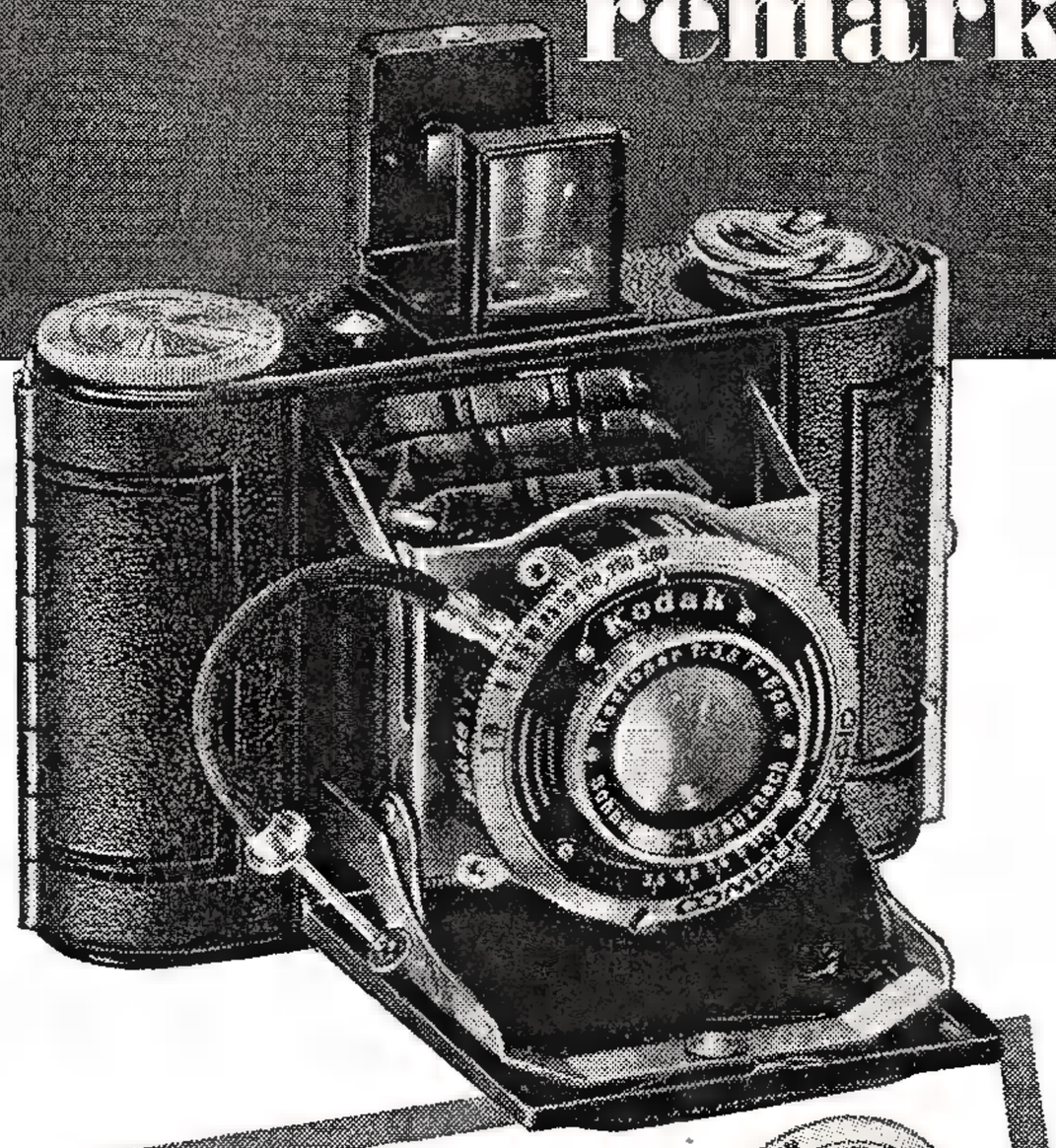
DEVELOPING HOME MOVIE FILMS

I own an 8 mm amateur motion picture camera and plan to process the film myself. Can you furnish me with the necessary instructions for doing this?—T. M. Benson, Marion, Ohio.

Processing home motion picture films involves delicate chemical operations which should not be attempted by the novice. Realizing that even the experienced photographer did not possess the necessary equipment for reversing home movie film, the manufacturers included the cost of reversing along with the purchase price of the film. After the amateur has exposed the roll of film he merely has to mail it back to the factory where it is developed and returned to him ready for projection.

The photography editor will pay $5.00 or $3.00 each for photographs interesting enough for publication on this page. All pictures should be mailed to Modern Mechanix, 1501 Broadway, New York, N. Y.

Full-range "miniature" at a remarkably low price ...$44.50



KODAK VOLLENDA in hand, you're ready for every picture that comes along—off-guard snaps, lightning-fast sport shots, landscapes, close-ups, rainy-day pictures, indoor snapshots under Photofloods . . .

Brilliant *f*.3.5 anastigmat lens; 1/500-second Compur-Rapid shutter. Negatives are sharp, capable of extreme enlargement—especially when Kodak Panatomic Film is used.

See Kodak Vollenda at your dealer's. Weigh range and refinements against price, $44.50—you'll say it's the buy among "miniatures" . . . Eastman Kodak Company, Rochester, N. Y.

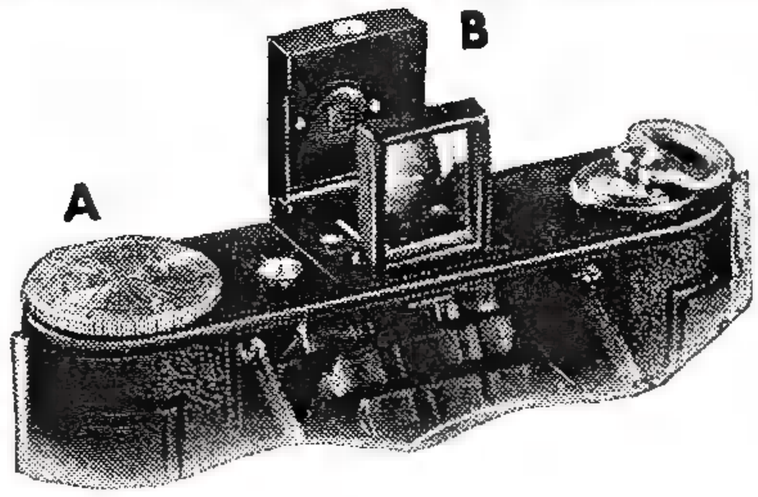
ONLY EASTMAN MAKES THE KODAK

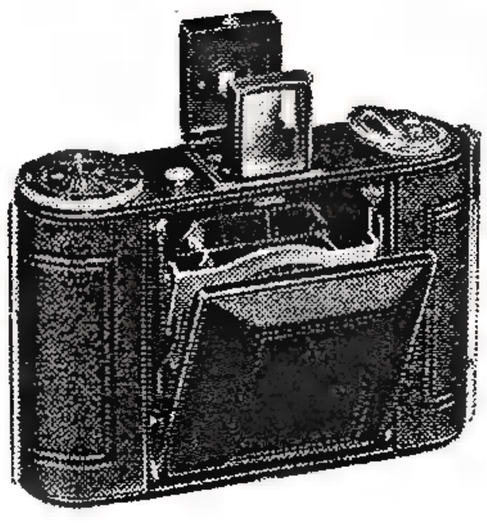
LENS . . .
Anastigmat *f*.3.5. You get sharp negatives from dawn to dusk; in clear, cloudy or rainy weather. Also makes snapshots indoors at night under Photofloods.

SHUTTER . . .
Rim-set Compur-Rapid gives you nine speeds up to 1/500 second for fast action—down to a full second for difficult light conditions.

REVOLVING LENS MOUNT . . . For quick, easy, accurate focusing from 3½ feet to infinity.

DEPTH-OF-FOCUS SCALE (A) Rotating outer ring shows sharp-focus range for any stop-and-distance combination. **FINDER (B) . . .** Direct-view, eye-level type; folds flat when not in use.





ACTION FRONT

Actuated by push button, automatically opens camera, extends bellows, erects lens, and locks front firmly in correct picture-making position.

YOU GET 16 PICTURES ON AN 8-EXPOSURE ROLL

Kodak Vollenda gives you 16 pictures, each 1 3/16 x 1 9/16 inches, on a roll of Kodak Film No. 127: Verichrome, 25¢; "SS" or Panatomic, 30¢.

Your negatives are critically sharp, and capable of extreme enlargement—especially when Kodak Panatomic Film has been used.

KODAK VOLLENDA

Inventions—Electrochemistry

[*Continued from page* 61]

and other goods are annually destroyed in the cities on account of rain.

"We should systematically investigate the application of electric currents in the stimulation of the growth of living cells and the formation of many organic compounds. The production of fruits, vegetables and other food materials in a few localities and then shipping them half way around the globe appears to us an awful economic waste and extravagance. With the aid of electricity, truck farms located in the outskirts of cities, or on the roofs of skyscrapers, will produce any, or all, fruits and vegetables. Why not?

"One other important problem is a means to convert ores into finished metal products easily and efficiently. Metals occur in nature combined with other elements, notably sulphur. The old process that dates back at least 5,000 years consists in roasting the sulphur compounds, thereby producing oxides; and then mixing these oxides with coke or charcoal and heating to high temperatures to reduce the oxides to metal—usually very impure at that. Electrically, it will be commercially possible some day to produce pure metals free from sulphur, phosphorus and other deleterious or objectionable impurities."

Dr. Fink is, himself, working on two important developments at the present time. He is experimenting on a way to convert the sun's rays into electric power and he is trying to find a satisfactory method of extracting gold from the seas.

In explaining his "power from the sun" theory, he told me that mankind was rapidly approaching the need for additional power resources.

"There is not enough water power on earth to supply more than 10 per cent of our energy demands," he said, "and since coal, oil and gas necessarily produce most of the remaining 90 per cent, a substitute must be found. I believe this can be accomplished through the use of photo-electric generator cells and I predict that the day will come when these cells will be placed, for example, on the roofs of large apartment buildings and will be used to operate electric refrigerators, flat irons, toasters, vacuum cleaners and other appliances. Still greater uses will of course eventuate."

Dr. Fink's new photo-electric generator cell produces about 25 per cent more current than devices formerly used and also is more sensitive to light. The current obtained is still far too small to be practical for commercial power generation but he expects a vast improvement will be made in the near future.

Pointing out that this cell is not the "electric eye" of the motion picture and television, he said it was composed of a sheet of metal in a salt solution or in contact with a salt which, like silver bromide, is sensitive to the sun's rays. Opposite to this sheet of metal, but kept in the dark, is a second sheet of metal. While the sun shines on the first an electric current flows from one sheet of metal to the other.

"It has been known for a long time," he explained, "that some chemical compounds are changed in composition upon exposure to the sun. Now certain of these compounds change in one direction only. Thus white silver bromide is converted to a black product when exposed to the sun, as all amateur photographers know. Another well known case, especially for the Sunday hiker, is the way green pop bottles will be found to have changed to a lavender shade after having been discarded and left to lie on the ground exposed to the sun's rays.

"The chemical salts or compounds we are particularly interested in at the present are those that will change to a new compound in the light but will change back to the original when placed in the dark."

The "gold from the sea" problem is one that has baffled scientists for many years. One of the main difficulties in this field has been the fact that the gold particles, or ions, that carry a positive charge of electricity, are unable to get close enough to be deposited on the negative electrode, or cathode, because the alkaline film surrounding the cathode is too thick. This alkaline film is brought about by the decomposition of sodium chloride (ordinary table salt) at the cathode, the sodium ions being converted to sodium hydroxide (lye).

Dr. Fink has succeeded in overcoming this film obstacle by rotating the cathode at high speed, an action that reduces the thickness of the alkaline film.

He uses a copper disk for his cathode, which is electrically propelled and spins around at a terrific speed.

It is interesting to know that his original apparatus was the familiar malted milk stirrer. He took off the little nut at the end of the rod and replaced it with a copper disk the size of a half dollar.

But the speed of the malted milk machine was not high enough and he substituted his present apparatus which, while considerably larger and heavier, looks not unlike its smaller counterpart in any drugstore!

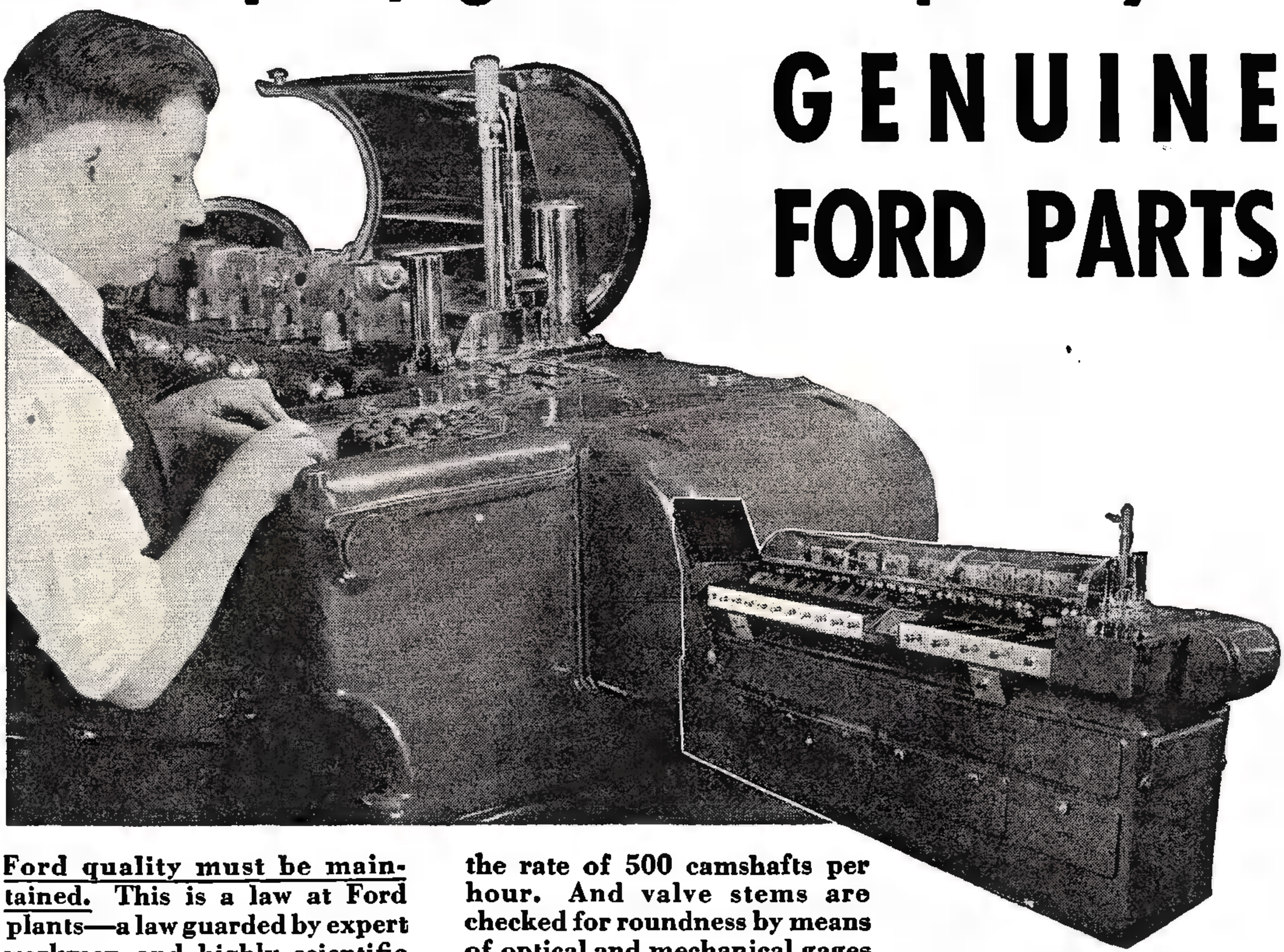
In a typical experiment, Dr. Fink employed a disk of 5-centimeter diameter, spinning at the rate of 8,500 revolutions per minute. The disk was set in three liters of a 3 per cent salt solution containing three miligrams of gold. At the end of a half hour, more than 90 per cent of the gold was plated out on the disk.

Dr. Fink pointed out, however, that hope of recovering billions from the seas must be dispelled for the present because the cost of the electricity to operate the cathode is about five times the value of the gold recovered.

He added that at the same time this procedure was more profitable in the case of radioactive metals. The metal polonium, for example, can readily and profitably be recovered from waste solutions.

Inspections, which no human skill can equal, guard the quality of

GENUINE FORD PARTS



Ford quality must be maintained. This is a law at Ford plants—a law guarded by expert workmen and highly scientific inspection machines during every phase of the manufacturing of Genuine Ford Parts.

One machine, for example, checks piston pins for smoothness, hardness, straightness, roundness and diameter at the rate of 1500 per hour. At one stage in the inspection an automatic scleroscope checks the pin for hardness. A small hammer is allowed to fall upon the pin. The rebound of the hammer measures, to a fine degree, the hardness of the metal. If the metal is of the correct hardness, the hammer rebounds to intercept a light beam from a photo-electric cell which automatically allows the pin to proceed for further inspections.

Another inspection machine gages camshafts at 25 points at the rate of 500 camshafts per hour. And valve stems are checked for roundness by means of optical and mechanical gages that keep the limit of variation within two ten-thousandths of an inch.

Because of such accurate and scientific inspections, because of Ford quality materials and Ford precision manufacturing, you can be sure of getting the best parts for your Ford by buying them from your Ford dealer or any garage that displays the sign "Genuine Ford Parts."

This automatic valve lifter inspection machine performs eleven different inspections on 35 valve lifters per minute — a total of 385 inspections.

All Genuine Ford Piston Pins are inspected for smoothness, hardness, straightness, roundness and diameter. Diameters are held within a variation of one ten-thousandth of an inch of specified sizes.

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GENUINE Ford PARTS

Clutch Disc Assembly. All discs are carefully inspected to make certain that all parts measure up to specified requirements.

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So You're Buying A House!

[*Continued from page* 70]

and rear walls and the attic. In some types of brick houses there is no room for wall insulation, as the firring strips (to which the plaster lath is nailed) is attached directly to the inner layer of brick, with less than an inch of air space between. In any case, attic or roof insulation is a necessity, because the usual plaster and lath ceiling is a sieve as far as the rising warm air currents from the radiators are concerned.

An average attic insulation job costs about $75 if you do it yourself, $100 if the "blowers" do it. The walls cost in proportion. If you contract with the builder to do the work, he adds its cost to that of the house, and you pay it off conveniently over the life of the mortgage. The additional cost per month is small, as even complete insulation for an average house costs only about $500. If you have the insulation done after the mortgage on the house is taken out, you will have to go through the same amount of red tape for the second loan. Of course, you can get along without insulation, but when the first cold snap comes along and you start buying oil, you'll be sorry you overlooked this protection.

Most small houses are furnished with gas ranges, but not even the largest come with refrigerators. Check off another $100 here, and that will buy only a small box. People accustomed to renting apartments and houses take the electric ice-box for granted, and they look somewhat dumbfounded when the builder says:

"The refrigerator? That's up to you."

Window coverings are still another little joker. You simply must have screens, otherwise mosquitoes and other insects will make life miserable during the summer in most parts of the United States. To close a difficult sale a builder sometimes throws in the screens as an inducement, but in nine cases out of ten they are not included.

The same applies to storm windows. These are not quite as necessary in winter as screens are in summer, but in exposed locations their use is imperative. Without them, "cold zones" develop around the windows, even with good insulation in the walls, and a lot of valuable heat is wasted in warming up the window panes instead of raising the temperature of the rest of the room. Storm windows should be fitted with the same kind of hooks as the screens, to make for easy interchangeability.

Figure about $2.50 average per window for screens and a little more for storm sash and you'll know why the builder doesn't say anything about these items in his prospectus.

Venetian blinds are all the rage now. Appreciating their attractiveness and sales appeal, many builders put them on the front windows of a house, but not on the back. Of course, your wife will want to complete the effect, and that means about $5.00 per window. They really are worth it, because they give full privacy without cutting

[*Continued on page* 135]

Records Prove Zeppelins Safe

[*Continued from page* 47]

an even chance of getting away. Proof of this was given a few years ago, when the *Los Angeles* sighted the aircraft carrier *Lexington* during fleet maneuvers, and observed it for an hour and 55 minutes before being discovered, although the *Lexington* had several planes in the air.

The reason for this is apparent to anyone who has ever done any flying. It is quite simple to sweep the horizon with a strong glass, spot any ship on the surface within the limits of visibility. It is quite something else again for the lookout on a ship to watch the immense dome of the entire sky effectively. In practice, it would be quite possible for an airship to discover the approach of a hostile fleet in mid-ocean from a distance of 40 miles, radio its position and size, and escape without the enemy being aware he had been observed.

Inflated with non-inflammable helium, the airship is by no means as vulnerable a target as is popularly supposed. Those who think a few machine gun holes in the bag will doom the ship do not realize that there is little pressure on top of the bag, none at all on the sides and bottom.

There were four valves 32 inches in diameter on each of the *Macon's* twelve gas cells, yet with all valves fully open, it took several minutes to effect an appreciable change in buoyancy. Hundreds of machine gun bullets would do very little damage to such an airship. In the meantime, machine gunners aboard the dirigible, and the five planes it carries, could do quite a creditable job of defending itself.

Bombing and shell fire are something else again. A plane could easily destroy an airship by dropping bombs on it. The airship has no business coming within effective range of shell fire.

Although the Navy, especially the younger officers, still want additional airships, no definite steps are being taken (that they will admit) to procure them now.

The policy seems to be that, with the recent large appropriations for bringing the fleet up to treaty strength, it would not be wise to ask for additional appropriations for airship construction, with the *Hindenburg* tragedy so fresh in the minds of congressmen. They are, however, laying definite plans to go ahead with the development of airships when the time seems more propitious.

The Secretary of the Navy says:

"The *Hindenburg* tragedy will not effect the Navy's decision, because it resulted from a hydrogen fire, and American ships use, instead of the highly inflammable hydrogen, an inert gas, helium, which while it has less lifting power than hydrogen, does not either burn or explode."

So the immediate future of the airship is still in the hands of the Germans. For the next sky queen, we must await the arrival of the helium-filled LZ-130.

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Restocking The Ocean

[*Continued from page* 65]

on its spawning grounds. The Bureau of Fisheries feels that there will yet be a good many fish caught in the New England fishing grounds.

This unprecedented amount of eggs, with the exception of the mackerel, was planted by only two stations, the one at Gloucester producing the majority of cod and all of the pollock, while Boothbay Harbor distributed most of the flounder and has a slight edge on the haddock output. The Federal laboratory at Woods Hole, Mass., handled the mackerel eggs and young fish.

One other valuable sea-food, the shad, is drawing the attention of the Bureau for the first time. At Fort Belvoir, Virginia, the Federal hatchery obtained almost fifty million eggs, hatched them and released the resultant fry in suitable waters, mostly in Virginia and North Carolina.

In this business of planting eggs and hatching fish, man's method has an advantage over nature's. For this reason: There are countless fish in the sea that devour eggs and young of other fish, and in many cases, even their own. Fertilized eggs laid on the spawning grounds by any fish are open and defenseless against any marauder who wishes to make a meal out of them. Thus untold millions of them perish. In fact, scientists claim that the percentage of cod fish eggs that reach maturity can be reckoned in fractions of one percent!

The eggs hatched and raised by the Bureau of Fisheries are taken from fish already caught (the process is known as "stripping") which, in that case, never would be deposited in the ocean, for the fish are in the holds of commercial vessels, on their way to market. Shielded from their natural enemies, the mortality of these eggs is almost nil, and especially if allowed to hatch, the chances of survival are far higher than if the parent fish were not caught and had laid the eggs in the ocean. In fact, Bureau scientists point out that this work really comes under the head of salvaging, due to the fact that without their intervention, none of the eggs would ever hatch into young fish.

Naturally, re-stocking the Great Lakes presents an easier problem. Once the fish are there, they can't get out. The cisco (also known as lake herring), possibly considered the greatest delicacy that ever came out of the Great Lakes, once especially plentiful in Lake Erie, is not only nearing extinction, it is practically wiped out, as far as commercial fishing is concerned. And so the Bureau is trying to bring the cisco back again.

With great and painstaking effort, specialists at the Bureau hatchery at Cape Vincent, New York, succeeded in collecting a bare 2,640,000 eggs which they have planted in Lake Erie and others of the Great Lakes. Two million and a half fish may seem a fairly large number, but it is only the beginning compared to what is needed to bring the cisco catch anywhere near up to what it was two decades ago.

Is There A Speed Limit?

[*Continued from page* 39]

high acceleration have been made by Jimmy Doolittle, well-known speed pilot. He determined the acceleration speeds for such maneuvers as single and multiple barrel rolls, power spirals, tail spins, loops, Immelman turns, and power dives. He also found that the accelerations of an airplane flying through moderately rough air do not exceed 2.5 gravity.

The maximum acceleration a pilot can stand depends upon the length of time he endures it. No ill effects are suffered under an instantaneous 7.8 gravity acceleration; but, if the pilot is subjected to an acceleration of only 4.5 gravity for a matter of several seconds, he loses possession of his faculties.

The effects of 4.5 gravity acceleration are not dangerous to health unless the acceleration continues for ten or twelve seconds. Beyond that, death is practically certain.

The above are the acceleration limits possible to man, no matter whether he is traveling on a straight or a curved line. This seems to explode the notion that men will be able to fly in rocket ships at a takeoff velocity greatly exceeding that of catapulted airplanes.

Man-carrying rockets, if they are to be successful, must build up their speeds gradually. Rockets do not, of course, reach maximum speed immediately, but their launching speed and speed of acceleration are doubtless greater than man can endure with safety.

The experimental flight of the mail-carrying rocket, "Gloria," across the New York State line at Greenwood Lake, did not demonstrate any remarkable speed, although the theoretical speed of the rocket employed was estimated at 500 miles per hour. Dr. R. H. Goddard's torpedo rocket in New Mexico has attained a velocity of 700 miles per hour, the highest speed ever attained by a man-made power device traveling in free space.

Seven hundred miles an hour, it may be noted, is 125 miles an hour beyond the critical speed of the modern type of airplane. Nevertheless, that is a low speed for a rocket. Rocket design is far different from airplane design, and their maximum velocities are, likewise, wide apart. Rocket speeds really begin where airplane speeds end.

The burble, a serious annoyance in airplane speeds, does not affect the rocket to such an extent. Rockets must, of course, travel through low altitudes also, but they never reach their maximum efficiency until they strike the rarefied zones of the stratosphere and the ionosphere.

But there is a speed limit for everything. Rockets will never exceed the speed of light, 186,000 miles per second, but at some future date they are expected to escape the earth's gravitational clutch with a built-up speed of seven miles per second, or 25,200 miles per hour.

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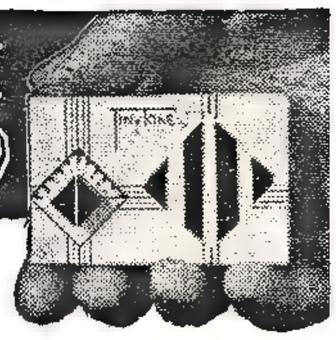

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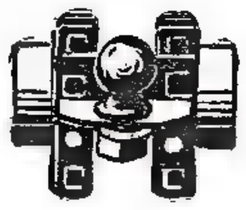

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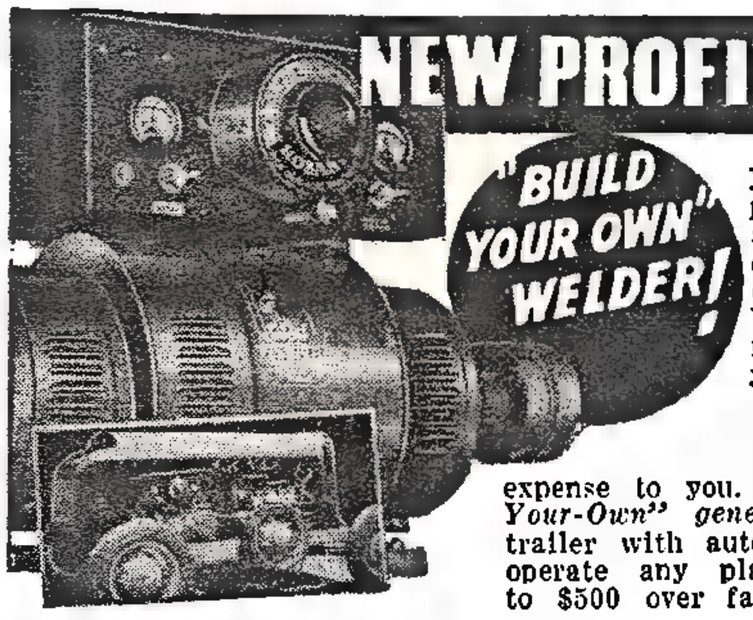

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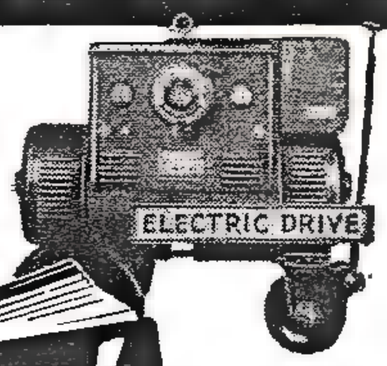

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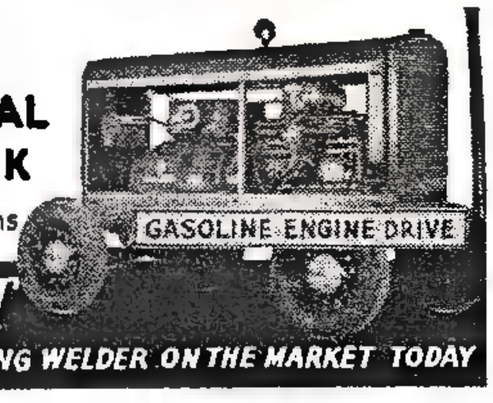

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Racing The Homing Pigeon

[*Continued from page* 55]

convoying the Pittsburgh birds, I carefully observe weather conditions and winds at home, especially early in the morning. Upon arrival at the race point, I compare weather and winds. A detailed check up on weather conditions for a few days previous to a liberation gives me an idea on what sort of wind and weather conditions I can expect.

"When the crates or shipping baskets are first taken out of the car, they are stacked five high and no two crates from any one club are placed together. They are so arranged that each and every club will have its birds in various stacks. As the crates are piled in the form of steps, each crate as it is opened will rest upon the top of the crate beneath it. I arrange all the doors for liberation and the men are lined up at the doors of the crates so as to get the birds out as soon as possible upon the liberation signal.

"The birds, upon gaining altitude, fly in about eight to ten different flocks. They wing around for various lengths of time and before long are lost to sight. On the first race the birds wing around a lot, but following races find them doing better. They seem to pick out the various winds. I like to leave them up early as that gives them a chance to get home in good shape before the different winds blow them all around. The liberation is a wonderful sight to behold and anyone living near a race site station should at least try and see the spectacle."

After the birds are released, the convoyer sends a telegram to the secretary of the Racing Pigeon Center in the city to which the birds are to home, stating the liberating time, direction of the wind, and weather conditions. This secretary then phones the secretary of each club affiliated with the center, giving him the information noted in the telegram.

The parts of one of the common timers used along with a countermark may be observed in one of the photographs illustrating this article.

Every fancier must have a distance measurement in miles and fractions by air line from each race site station to his loft. These distances are figured by a nationally known "surveyor."

As there are 1,760 yards to a mile, by multiplying this number by 60, the result is 105,600. Multiplying the distance measurement by 1,056 (omitting the last two figures for convenience) the result is the distance reduced to sixtieths of yards. If the distance by airline is 105.47 miles from the 100 mile race station, by multiplying 105.47 by 1,056 the result is 11,137,632. Reducing 2 hours, 31 minutes and 31 seconds (time consumed in flight) to seconds the result is 9,091 seconds. 11,137,632 divided by 9,091 gives 1,225.12 yards per minute. The fancier with a longer distance measurement will have an "overfly" on the one with a shorter distance measurement; that is, a bird flying 105 miles could be clocked so many minutes or seconds later than a bird clocking at the same time or sooner and only flying 100 miles and still win because it had a miles farther to fly. The bird making the greater speed wins the race.

There is no sport that is more dependent on wind and weather conditions for successful racing than that of pigeon racing. If the birds have tail winds and good weather on their flight homeward, their speed will be greater than if they have to fly under adverse conditions. Pigeons have been known to fly over 2,000 yards per minute in some races.

It may be interesting to know that a 500-mile flight was first made on the day of liberation in the United States in 1885 by a bird named "Ned Damon," flown by Mr. Fred Goldman. A flight of 500 miles on the day of liberation was first made in England by a pigeon owned by a Mr. Pointer of London in 1896, eleven years after the brilliant performance of "Ned Damon," so one can see that even at this early date the American birds were leading Europe in performance.

Mr. E. S. Peterson of San Antonio, Texas, is another long distance fancier. Some of his birds have flown 700 miles on the day of liberation and 800 miles more early the following morning.

C. W. Oetting of Ft. Wayne, Indiana, bred a bird he called "Wayne Jr." that flew 1,000 miles in 24 hours-22 minutes-20 seconds, at a speed of 1,122.43 yards per minute.

J. Kozlowski of Baltimore, Md., had a bird he called "Miss Havana" that flew from Havana, Cuba, to Baltimore in 1930 in four days. This bird, when released with several others, faced a water jump of 100 miles with high temperatures and prevailing winds against her. The shortest airline distance after she made Florida territory to her loft was not less than 1,300 miles, so one can see that it took real courage, stamina, and determination on her part to keep going.

In June of each year the Chattanooga National Race is flown from Chattanooga, Tenn. This is a race to which fanciers living hundreds of miles away from Chattanooga send their best birds. And it takes a good bird to win, as it is competing against birds flying to Boston, New York, Washington, D. C., Philadelphia, Pittsburgh, Detroit, Cleveland, etc. The bird winning the race is awarded $100.

These birds, off in a flurry at daylight, meet varying conditions ranging from ideal to overcast skies, changing winds, and the possibility of rain squalls or storms on their way homeward.

The 1935 winner, a Blue Checker cock named "Chattanooga," is owned by D. J. Clagett of Woodside Park, Md. This male outdistanced 1,114 champion racers from 63 cities and covered 525 miles in less than 11 hours.

In 1936, the winner was also a Blue Checker cock bird. This bird is named "Swiftwing" by his owner F. E. Gorely, of Washington, D. C. Flying 534 miles, he arrived home the second day of liberation at 4:37 a. m., beating 1,151 birds from 278 lofts!

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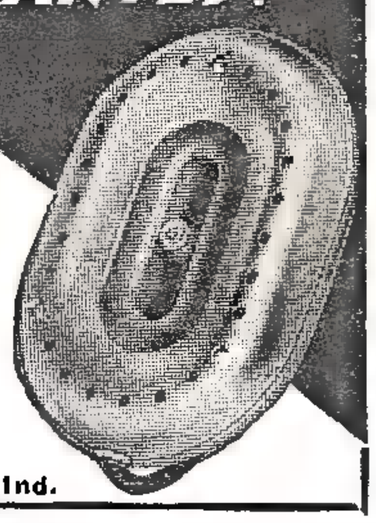

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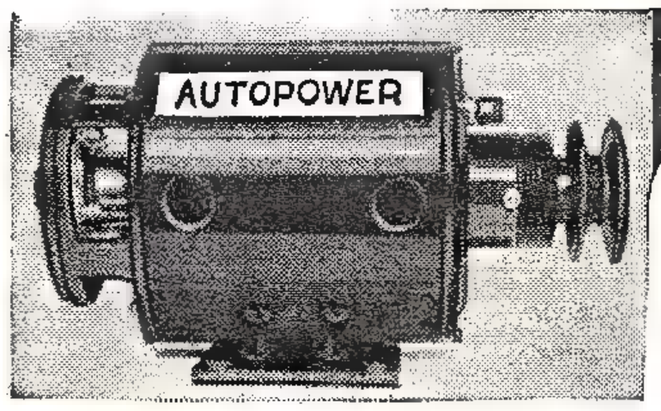

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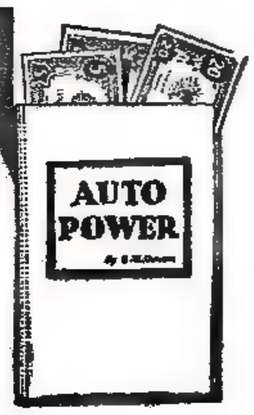

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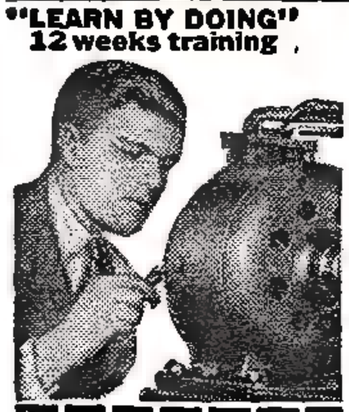

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Body Completes Racer

[*Continued from page* 89]

a ⅝" mile dirt track and a rough one too. The best average in ten laps was 33.2 seconds per lap or about 69 m. p. h., just 4 seconds slower than the best average for full-size racers on this track. Dirt tracks are so rough that the tires can't be pumped up to full pressure. With the low air pressure, centrifugal force shows its effect at around 65 miles an hour and the tires begin to "stand up" or increase in diameter. At full pressure, this doesn't take place until a considerably higher speed is reached. In either instance, it is a precarious situation because of the loss of traction. If it were not a front-drive, it would be almost impossible to hold the car on its course under such conditions.

Just to find how good the front-drive was at pulling the car out of a spin or skid, the racer was deliberately thrown broadside on the Ascot track at 70 miles per hour. If this were tried with a rear-drive car of the same size and weight, results would be disastrous. From tests of this nature, it has been found that the driver must never go into a turn faster than he can continue through it. If you slow down during a turn, a spin is almost sure to follow and you must open the throttle instantly to pull out. Remember this: Always slow down *before* you go into a turn, then, as you make the turn, keep the front end pulling by gradually increasing the speed.

At Muroc Dry Lake, test runs have been made to find how the car would behave at its top speed. At speeds of 90 to 100 miles an hour, it begins to feel rather light and has a tendency to drift with the slightest breeze, though at no time does it try to get out of control. At this speed, it is still possible to maneuver the car at will, providing that each move is made with caution.

When 115 or 120 miles per hour is reached, which has been accomplished on several occasions, any attempt to maneuver the car, other than to keep on the course, is out of the question due to loss of traction. The tires increase to nearly 24" in diameter, and the side walls are not much over 1½ inch apart. There is actually less than 1" of the tread width in contact with the ground. This can be clearly seen when driving the car; It shows up as if a black stripe had been painted around the apex of the tread on the tires. Sometimes a trace of smoke is noticed when the top speed is held very long on a hot day. After a fast run, to put your hand on the tires is like touching hot wax.

At top speed any attempt to slow down must be done with the utmost caution for the rear end, due to momentum, moves forward when the car is slowed down too rapidly. The only way to keep the car from performing in this manner is to step on the gas again.

When running at high speeds, you might as well have no brakes at all, for in the first place, should an emergency arise, you probably wouldn't have

time to use them, and even if you did, it wouldn't help matters any. To apply the brakes, no matter how carefully, the car would respond by doing plain and fancy somersaults.

While the foregoing statements might lead you to believe that the Arlen Special is an extremely dangerous car, it is, on the contrary, safer at high speeds than a comparable rear-drive car would be. Everyone realizes that high speed driving with any car is more or less dangerous. Careful and skillful driving and frequent inspection of the car are the best way to avoid accidents and that applies to any racer.

At ordinary road speeds, the Arlen is as safe as any car. As for the brakes, they are practically as efficient as four-wheel brakes on a normal sized car, because of the large braking surface area in proportion to the weight. Under normal driving conditions on the highways, it is doubtful whether you can tell by the feel that it is a front-drive type. But on slippery roads and loose sand or gravel, it is much steadier at all speeds than a rear-drive. It is just as easy to steer as the conventional type of car and the universal joints have no tendency to bind in a sharp turn.

On account of the small road clearance, it is advisable to keep off of very rough, rocky or uneven roads. Stay on the smooth highways where you can take full advantage of the car's features.

The building of "Arlen Special" cannot be completed over a period of one week. This car, it must be understood, is an elaborate project that requires the highest degree of careful planning before any construction work can be attempted. Patterns for the chassis and body should all be enlarged to full size plans by drawing them up on heavy brown wrapping paper. Before having any welding work done, make absolutely certain that parts are assembled correctly.

"Arlen Special" will perform exceptionally well if the car is assembled step by step as outlined in the two previous installments, which appeared in the June and July issues of MODERN MECHANIX. Work can be simplified to a considerable extent by working from the blueprint plans which have been prepared on this midget racer. While not actual size, the blueprints are sufficiently large to permit being used to best advantage in the home workshop or garage. Those who now have the "Arlen Special" under construction, or who are planning to build this car, can obtain copies of these genuine blueprint plans at $3.00 per set. All orders for blueprints should be addressed to Modern Mechanix Publ. Co., Blueprint Dept., Greenwich, Conn.

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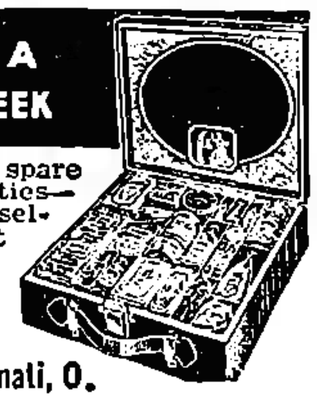

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Modernizing Your Graflex

[*Continued from page* 110]

figures, the number of feet from the camera to the moving object and the right figures are the shutter speeds necessary to stop motion at right angles to the line of motion. Only two-thirds of the speed is necessary if the picture is taken at a 45-degree angle.

At the bottom of the right hand card are the hyperfocal distances for the 6½-inch lens used. The hyperfocal distance for each stop is that setting which will result in satisfactory sharpness from half that distance to infinity. For example, if it is desired to photograph a scene in which everything from 30 feet to infinity will be in focus, it will be necessary to set the camera for 60 feet and use the f. 11 stop.

In calibrating the focusing knob, the hyperfocal distances for the camera lens were used so that they could be set to correspond. The data cards save much time and are well worth installing on your Graflex.

With modern film emulsions there are few pictures which could not be improved by the use of an appropriate filter for the effect desired. Glass filters cost several dollars each, but gelatine filter material costs only 40 cents for a piece 8 inches square. However, in order to use this cheap and fragile gelatine, a holder is necessary to permit it to be clamped over the lens, in an exact plane with the lens and perfectly smooth, so that no distortion will be introduced into the picture.

Also, it is desirable that a lens hood be used to keep out the stray light rays that strike the lens from points outside the scope of the picture and cause a lack of brilliance in the negative. A combined filter holder and lens hood of heavy cardboard, designed to fit in a regulation filter holder intended for glass filters, can be made of heavy cardboard and works perfectly, being light and strong.

Three pieces of cardboard are needed, two of which will slide into the filter holder together. They, each, have a round hole, the size of the lens opening, and are hinged with gummed fabric with the gelatine placed between these two pieces. The third piece forms the truncated pyramid, which is the lens hood, and is fastened to one of the first two pieces with strong glue. The inside of the hood is then covered with the dull black paper from films or enlarging paper to do away with reflections.

To use, place the proper gelatine filter between the two cardboards with the holes, close them and slide into the metal filter holder and clamp over the lens. If you desire to use the hood without a filter, omit the gelatine. The gelatine sheets can be carried between the leaves of a little book when not in use to keep them clean and flat.

The last gadget is one which has been a life saver on more than one occasion. It is a photoflash attachment that will take almost every kind

of night picture required. The holder for the reflector is a flashlight case of the type intended for clamping on the steering post of an automobile. Part of the bracket is removed and the bracket screwed to the camera box. From this bracket, a flat brass strip is run to the upper shutter mechanism. Below the operating arm, for the focusing mirror, a piece of bent spring brass is fastened so that when the shutter is tripped and the mirror swings forward, it makes contact with the brass strip a fraction of an inch before the arm stops.

From this bent strip another strip runs to one pole of a switch, originally intended to be fastened on the edge of an automobile dashboard, but now fastened to the camera with screws so that it is "off" when snapped up and "on" when snapped down. From the other pole of the switch a piece of spring brass extends for one inch, shaped so that a piece of wire can be clipped under it.

Next, take a regular photoflash reflector and fasten a hose clamp around it, over the button, so that a solid contact is made. Drill a hole in the bottom of the case and insert a wire fastened to a contact in the middle of a wooden plug that will fit in the case between the tension spring and the bottom battery. Scrape any paint off the case, where it will snap into the bracket, so that a good contact is assured.

To use this photoflash attachment set the switch on the camera to "off," snap the reflector into the bracket, clamp the wire under the brass strip as shown and place a bulb in the reflector. Now set the curtain aperture at "0" and the tension at "1". Be sure the mirror arm is swung toward the *back* of the camera, then set the lens stop at f. 11 or f. 16 for close-ups or f. 8 for distance shots and focus the camera for the proper distance by means of the calibrated focusing knob.

Aim the camera at the subject, snap the switch "on" with the right thumb and trip the shutter with the left thumb. The shutter setting is for 1/10 second and during that time the flash goes off, taking 1/50 second, enough to stop most motion. The extra time the shutter is open the lens is stopped down so far that nothing else is likely to be recorded on the negative. Now snap the camera switch to "off" and change bulbs. As long as the switch is "off" the bulb is safe and normal pictures may be taken as usual with the camera. When the occasion arrives when the flash is needed set the shutter in position, flip the switch to "on" and the flash is ready for use.

With these added pieces of equipment the versatility of the Graflex is increased, permitting its effective use for a much wider and more difficult range of subjects and conditions.

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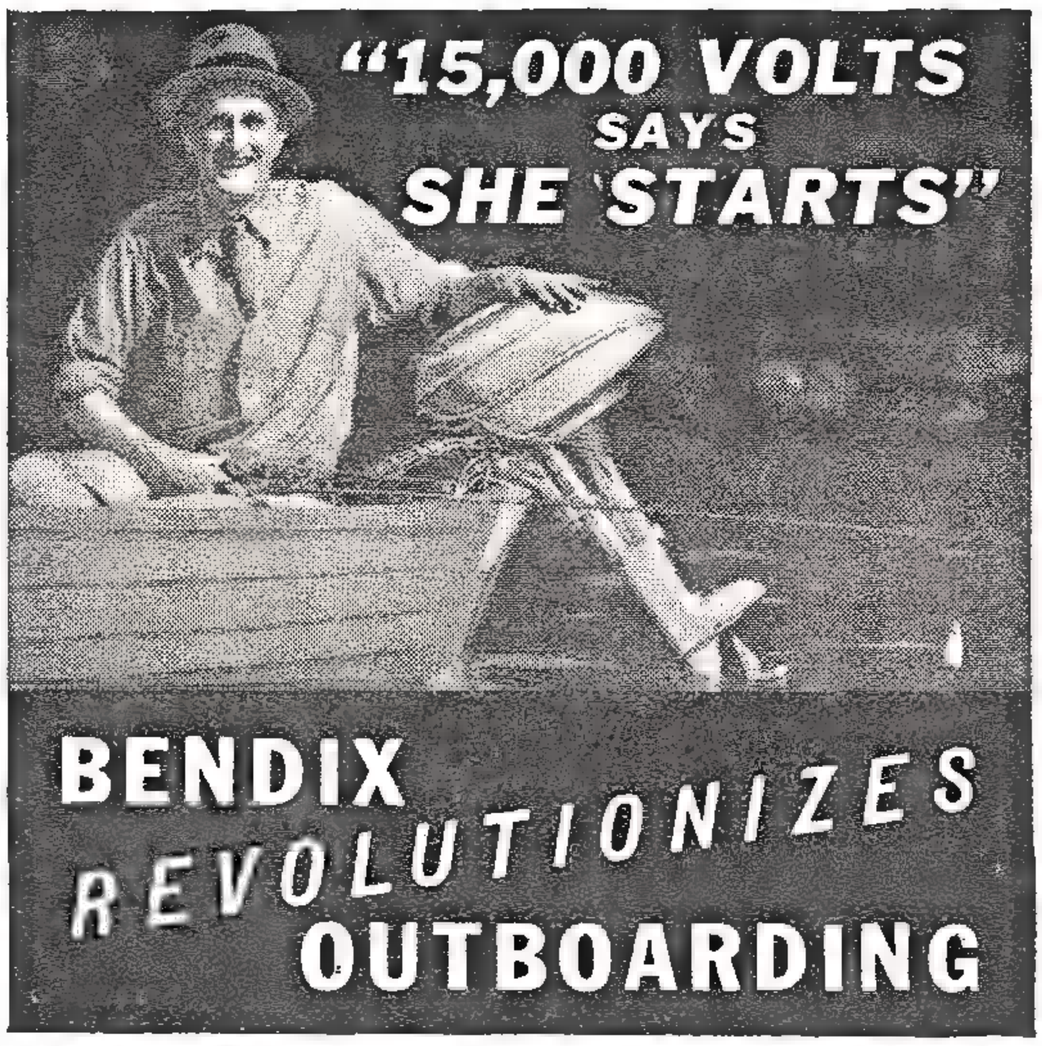

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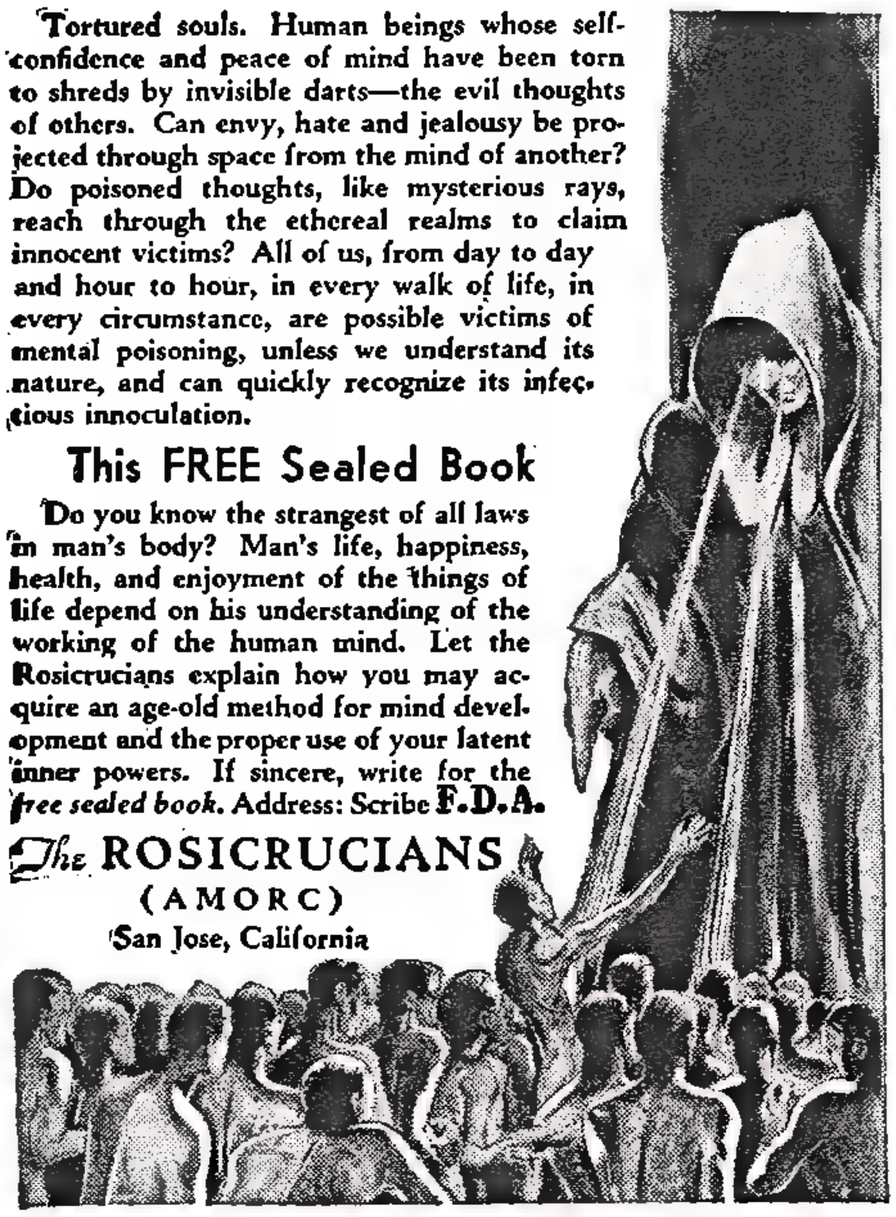

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A Recording Rain Gauge

[*Continued from page* 81]

clips are able to grip it. Graph paper for this drum can be purchased at any architectural supply store, the preferable type has inch divisions sub-divided into tenths of inches. A 12-inch circumference drum makes each large horizontal division represent five minutes of time.

The copper funnel, for collecting the rain, has a 2-inch vertical edge to prevent the rain from splashing in or out. The top of the funnel is 1½ inches in diameter and the lower tube is ¼-inch in diameter. To this lower tube a 10-inch piece of rubber tubing of appropriate size is fastened.

The float tube is constructed from the same size tubing as the top of the funnel. To this tube, which is 10 inches tall, solder a side arm connection 1½ inches from the top, for attaching the rubber tubing from the funnel. The side tube should not extend on the inside of the float tube or it will hamper the action of the cork float. The side arm tube is cut from a ¼-inch copper tube so as to fit the rubber tubing that leads from the funnel. The cap for the float tube is formed of thin copper sheeting, and provided with a $\frac{3}{32}$-inch hole in the top of it for the float wire.

A cork, coated with shellac for water-proofing, is used for the float. Being slightly smaller in diameter than the float tube, it insures smooth action with a minimum of wabbling. Using a 9-inch piece of No. 12 wire that has one end flattened, and a hole bored in it, stick the round end through the hole in the float cap and after coating this same end of the wire with glue, push it into

[*Continued on page* 133]

"Ether Imp"—A Transmitter

[*Continued from page* 103]

measuring only ½-inch in diameter. The tube's petite, proportions are not its only virtue, however, for it is the only one that will satisfactorily oscillate at 400,000,000 cycles, which is the frequency of the ¾-meter band. While the usual receiver tubes, have, in some cases, been made to oscillate at these frequencies by freak hook-ups, the "acorn" tube stands alone in its ability to give a reliable, stable and non-fluctuating signal.

The "Ether Imp" is built into a small box 3-inches wide, 3½-inches high and 2-inches deep. The box should preferably be of wood, since the capacity of a metal housing will prove troublesome because of hand capacity produced at ultra-high frequencies. The box should have a sliding front, to facilitate installation of the parts and to make them readily accessible for adjustment.

At the top of the box, install two ¾-inch feed-through insulators. These tiny insulators hold the miniature doublet radiating antenna in place.

The single button lapel mike, that modulates the carrier wave, is fastened onto the sliding front of the box with a machine screw. At the left side of the housing a pointer knob and a dial index are installed to make the tuning condenser easily adjustable.

The handle from an old screwdriver, chisel, or similar tool makes an ideal grip for carrying the transmitter. Before fastening the handle to the box, a ¼-inch hole is drilled through it lengthwise to later take the 4-conductor flexible battery cable.

The variable tuning condenser is homebuilt and consists of two semi-circular brass plates, with a radius of ¾-inch. One of the plates is fastened to the shaft of the pointer knob at the side of the housing, so that it will revolve. The other plate is mounted in a stationary position to a small bakelite strip as shown in the diagram. The distance

between these plates must largely be determined by experimentation, since all sets will vary somewhat. In no instance though, should the gap be greater than ⅛-inch.

Commercial sockets specially made for the "acorn" tube can be purchased or you can make your own from a two-inch square of bakelite. The tubes are provided with five "pigtail" leads, instead of the usual tube prongs, and connections are made through these leads. Provision must be made on a home-built socket for the five contacts. Five Fahnestock clips will do. Note that the grid and plate are together at the top, and the cathode and two filament leads at the bottom. The bakelite square is supported at each corner on a ½-inch insulator. Drill a hole ½-inch in diameter in the socket's center to accommodate the base of the tube.

The tuning inductance is wound of No. 18 enameled copper wire and consists of 8 turns, each turn ¼-inch spaced from the next. The outer diameter of this coil should be ½-inch, therefore it must be wound on a $\frac{5}{16}$-inch form to allow for the size of the wire and its expansion after winding. The completed coil is supported on ½-inch insulators, one at either end.

The hook-up is not at all complicated. The feed-through insulators at the top of the transmitter housing connect to the coil, one to either end, and contact should be made through No. 28 enameled copper wire. Leads to the insulators should be spaced as far as possible from each other. The radiating antenna is of the modified doublet type and consists of two lengths of copper strip, each exactly 7¼-inches in length. Each is drilled at the extreme end and fastened to the insulator.

The left end of the tuning coil, or grid end, connects to one lead of a .00025 mfd. fixed mica "postage stamp" condenser and to the moving plate of the variable tuning condenser.

The opposite end of the .00025 fixed mica condenser connects to the grid lead of the tube and thence to the cathode connection through a 15,000-ohm grid resistor of 1-watt carbon variety. It will be noted that the cathode lead is the center connection of the group. The cathode tap also fastens to one side of the single button lapel type carbon microphone. The opposite side of the mike connects to the negative filament connection.

The plate connection of the "acorn" tube connects directly to the plate end of the coil. The plate also makes contact with the stationary plate of the tuning condenser. The radio frequency choke construction is decidedly critical at this high frequency and in this particualr circuit should consist of No. 32 cotton covered wire, close-wound on a form ¼-inch in diameter for a distance of about 1¼-inches. One end of this choke goes to the plate contact of the tube while the other end connects to the positive "B" battery lead of the 4-conductor battery cable. The negative "B" battery cable connects to the cathode tap of the tube. The other two leads connect to the positive and negative filament contacts of the tube, respectively. The cable is then passed through the drilled handle of the transmitter, putting it entirely out of the way when using the set. A switch should be installed on the handle of the set and inserted in the negative filament lead to turn off the current.

WARNING! Do not try to solder the connections to the acorn tube, since the heat generated by the soldering iron may injure the delicate tube elements.

Before putting the set into operation, be sure to check the wavelength to make certain that you are operating in the prescribed amateur band. Measuring the wavelength at ¾-meters is very simple, being accomplished by the Lecher wire method as shown on page 103. About 5 feet of copper strip is bent "U" shape, spaced three inches apart and supported, by small insulators, on a wooden baseboard.

Insert a 0-200 milliammeter in the positive plate lead as shown. Place the bend of the copper strip near the antenna of the transmitter and then slide a copper bar along the copper strip so as to short the two sides. When the needle of the milliammeter reaches the highest point, measure the length of the strip around the bend, from one end of the sliding rod to the other, to determine the correct wavelength. The sliding rod should always be insulated from the hand when determining wavelength. In making these tests, have the transmitter in an upright position. The set will not oscillate if the mike is in a horizontal position, since the granules in the button make no contact when horizontal.

Next month, the companion ¾-meter receiver will be described for building. The two sets together make an ideal duplex or two-way communication system.

Until the receiver is built, you can check the modulation of the set and signal quality by using a set of earphones, shunted by an .001 mfd. fixed condenser, and a crystal detector in series with one of the leads. Connect one end of the crystal detector to the copper "U" at the point where the slider bar stopped and the other lead of the phones to the other side. This will pick up the signals originating in an adjacent room and allows for final adjustment of the transmitter before building the receiver.

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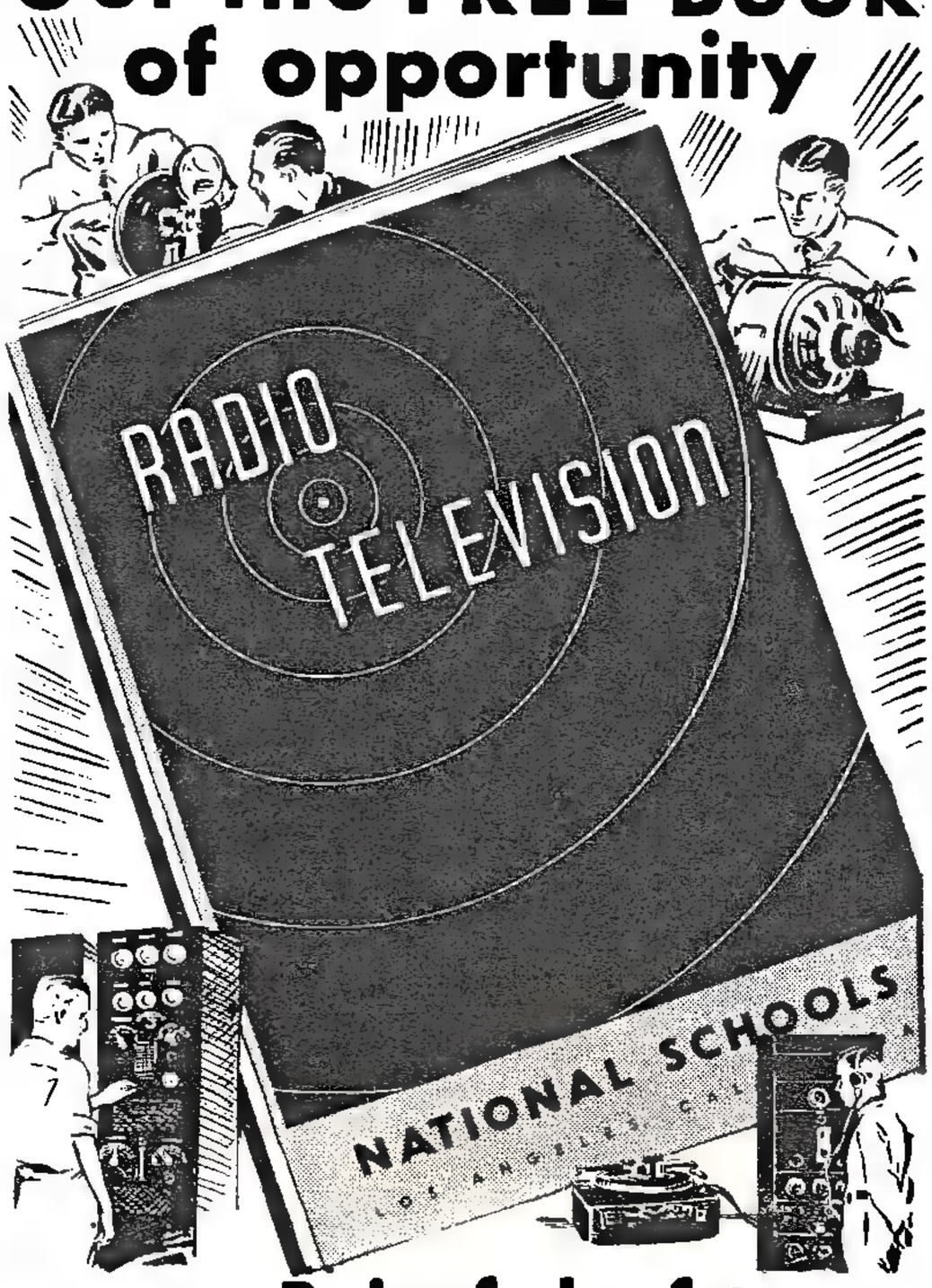

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Conditioning Your Sail Boat

[*Continued from page* 95]

fungus spreads quickly although it can often be easily killed. Dig out the rot thoroughly so preventative measures can be applied at once. If the spot is small and does not extend through the member attacked fill the cavity with wet salt or use one of the different preparations compounded to combat rot and mildew. Do not cover the spot at once but leave so its condition can be observed from time to time and further treated. Later, when the rot is killed, you decide against replacing the faulty member because of its otherwise good condition, fill the cavity with melted marine glue or pitch or pack the hole with salt and screw down a batten in marine glue over it. A handful of salt thrown in any unventilated locker or where fresh rainwater lodges will help prevent the wood being attacked by dry rot.

If the rot has advanced to such an extent so as to structurally weaken the boat have a boat carpenter replace the member. The renewing of a neatly fitted stem on a fair-sized boat, for instance, may seem an impossibility to the owner but builders have a saying that there is nothing built into a boat which cannot be replaced. Do not attempt such structural repairs yourself.

Simpler jobs are within the amateur's capacity and this is the time to do them while the boat is drying out and the weather improving. If the

[*Continued on page* 137]

Double Unit Floodlight Case

[*Continued from page* 114]

of all members for insertion of the aluminum or tin reflectors after the floodlight case has been assembled.

Proceed to assemble the case, using light finishing nails to add further strength to the glued joints. When both sections of the case have been carefully put together set them aside and allow one day for the glue to set.

In the meantime, a sheet of thin polished aluminum can be obtained and the reflectors cut from it. Two methods are available for this installation; one involves the use of three separate aluminum panels, as was used in the original, while the other permits the use of a single piece of aluminum, bent "U" shape and the ends inserted in the rabbets along the sides of the case to hold it secure. While the latter type of reflector requires little explanation, mention of the three piece reflector is in order.

Assuming that the case has been allowed sufficient time for the glued joints to dry, mount one piece of aluminum in the back and fasten it in place with small brads or escutcheon tacks. Next, insert the end of one of the side reflectors in the rabbeted groove and fasten it in position at a 30 degree angle. By previously fastening

[*Continued on page* 139]

A Recording Rain Gauge

[*Continued from page* 130]

the cork. To the top end of this wire, where the hole has been bored, bolt a piece of wood 5 inches long, $\frac{1}{16}$-inch thick and ¼-inch wide to serve as the pen arm. Allow 1-inch of the wooden pen arm to protrude at one end so that an appropriate counterweight can be attached. To the other end of the arm, glue a ½-inch cube of balsa, with a $\frac{3}{16}$-inch hole bored in it for inserting the pen. Halfway between the float and the balsa pen holder, glue a small wire hook on the pen arm to serve as a spring. This spring holds the pen against the graph paper while the other end of it can later be fastened to the back of the gauge shelter. The spring is made by taking a piece of No. 30 wire and winding it around a pencil. It must not be wound too tightly or it will prevent quick action of the pen on the graph paper. Its strength may be adjusted by experiment.

The pen, which is of original design, requires none of the customary slow drying inks, but operates very well using fountain pen ink. Procure a piece of ¼-inch glass tubing and heat it in the middle, above a hot flame, until the glass is flexible. Quickly pull the ends of the tubing, stretching the glass, and you will have a very small tube with a small opening in it, known commonly as a capillary tube. Now heat the tube and bend as shown on page 81, using the extra end as a hand hold. The unneeded end may be broken off by scratching the glass with a file and breaking it with the hands. If in operation, the pen allows too much ink to flow, the opening in the end may be heated more and closed still further. The curve in the tube is to prevent flooding and at the same time allow a large ink supply. Do not be discouraged at a few failures. With a little practice it is possible to make two or three pens in five minutes. It is wise to have several extra pens on hand in case one should break. When completed, the pen is mounted in the hole in the balsa pen holder.

The rain gauge, after installing the pen, is mounted in a wooden cabinet. A box, [illegible] by [illegible] by 20 inches, covered with oil cloth for water proofing and provided with a hinged door in the front, is well suited for the purpose. A 1¼-inch hole is drilled in the top of the cabinet for the funnel. The clock is mounted 7 inches above the bottom of the box. Since it rests on its back, it is elevated on four small nails so it is level, but still can be removed for winding. The float tube fits snugly in a block with a 1⅝-inch hole bored in it. The completed shelter is placed on a permanent platform, 1 foot high and secured by four small door hooks, one at each corner, so it can be brought indoors during the winter months.

The automatic rain gauge should be set into operation at the first hint of an approaching storm, as the record will not be harmed by con-

[*Continued on page* 135]

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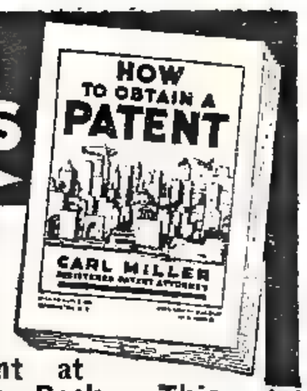

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A Walnut Ice Bucket

[*Continued from page 99*]

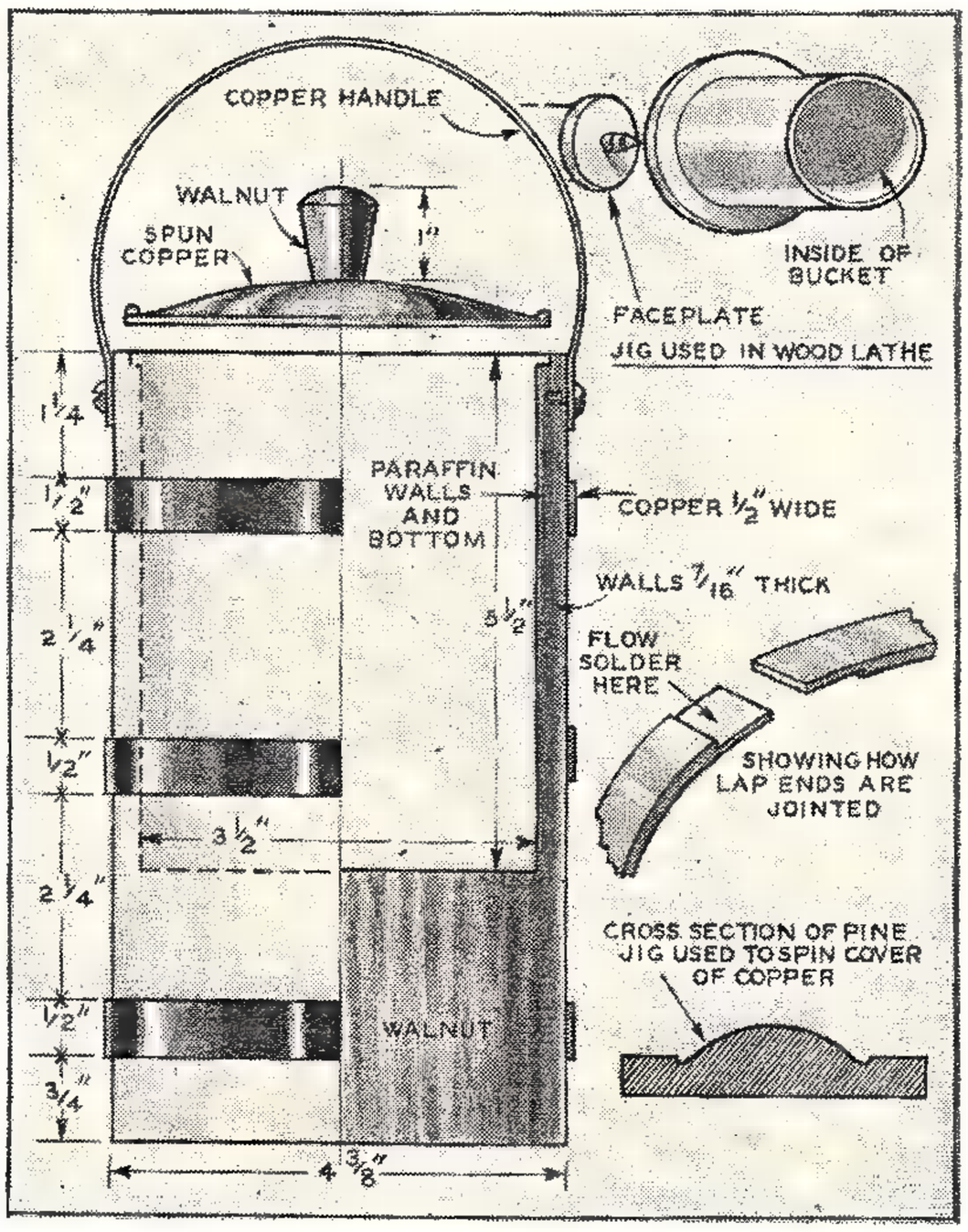
push it back slightly and very carefully remove a little more wood from the bucket.

When all three hoops are in position and spaced uniformly, smooth down the outside of each hoop by turning the lathe at a slow speed and holding a flat file lightly to the metal. Last, rub the hoops with steel wool to polish.

Before applying the finish, all cracks must be sealed with wood filler, but exercise care so that the filler does not get on the metal, then set aside and when dry, sand off the surplus lightly and apply a thick coat of clear lacquer, spar varnish or white shellac.

The shoulder to form the recess for the spun cover should be cut while the block is still in the metal lathe, since the end of the jig will cover it up.

Cut off enough of the bottom of the bucket to remove the tail stock mark and sand smooth. Cut and polish a



Before starting on the construction of the walnut ice bucket study this cross-section diagram thoroughly so that errors are avoided. The lid is of copper, spun over a turned wood jig.

strip of quite heavy gauge copper, ½-inch wide and bend to a "U" shape to form the handle. Fasten it in place with small, round head screws. Small washers inserted between handle and bucket will prevent the metal from scratching the bucket's finish.

To make the cover, slightly crown a block of white pine of good size and turn it off flat. The center of the crown should be about ½-inch higher than the edges with a groove around this crown of the same diameter as the extreme diameter of the cover is to be. Place this jig in the metal lathe, fasten a square of copper over it by bending down the corners and secure with small nails. Grease the metal surface well and, with a smooth, rounded rod, conform the copper to the shape of the jig. An excellent tool for this purpose is a steel ball about ½-inch in diameter which is welded to a ¼ by ½-inch iron bar 3 inches long. This is held in the tool post and the ball applied firmly, but not too hard, against the surface to be shaped. As a last step, crimp a bead around the edge of the cover, polish and then cut off.

Turn a small knob of walnut and fasten it to the lid with a small screw from the underside. Give knob and cover a coat of lacquer, spar varnish or white shellac.

Before the bucket can be used as a container for ice cubes, it will be necessary to waterproof the inside. To do this, dissolve a quantity of white paraffin in a tin can by placing it over a gas flame and, while the wax is in liquid form, brush it over the inside surface.

So You're Buying A House!

[*Continued from page* 120]

off ventilation. This is of particular importance in one-story houses whose windows are barely above street level.

You will want to keep your lawn in respectable condition and grow a few shrubs and flowers. That means a grass cutter, a roll of garden hose and at least a few elementary implements and supplies, to the tune of about $25. And then you'll find that animals, neighbors with baby carriages, and children on skates and bicycles trample all over your fresh seeds, and you'll wish you had put up a stout fence like the one the Jones's have down the street. You can do a pretty good job yourself with 2 x 4's for posts and ready-cut pickets, for about 40 cents a running foot, or you can be extravagant and have a fence company put in wire mesh and iron posts, at about a dollar a running foot.

You most certainly will want a finished room or two in the basement, for a darkroom, workshop or den. There's practically no limit to what you can spend here. A modest room about 12 by 22 feet (the full width of one end of a typical cellar) costs about $50 for simple board walls and insulating-sheet ceiling. When you buy the house allow yourself at least $100 for general "fixing up."

In a house equipped with an oil-burning furnace, the basement is just as liveable as any of the upper floors—frequently more so. The builder leaves it rough because he doesn't want to make the house appear expensive. Cover the ceiling beams, put up walls and a few curtains, paint the floor a gay color, and you increase the value of the dwelling tremendously.

Total the foregoing items and you'll see that a thousand dollars isn't too much to add to the "price" of a medium-size one-family house. Don't let this figure disturb or discourage you. It is better to be prepared for the expenditure than to have it overwhelm you later. Adopt the attitude that your house cost $5,790, and not $4,790, as the signs down the road indicate, and you'll never feel sorry that you spent more than you really intended.

A Recording Rain Gauge

[*Continued from page* 133]

tinuous operation. Recording without a rainfall merely makes a continuous line around the drum. When the rain begins to fall, the pen climbs up onto new graph paper. Should the rain last over one hour, or longer than it takes the drum to make one revolution, the record will still be preserved for on the second revolution of the drum, during a rainstorm, the pen will be above its former position and will not interfere with the first line.

Always leave enough water in the float tube to float the cork and pen arm, otherwise a rainfall will not cause an immediate rise of the pen.

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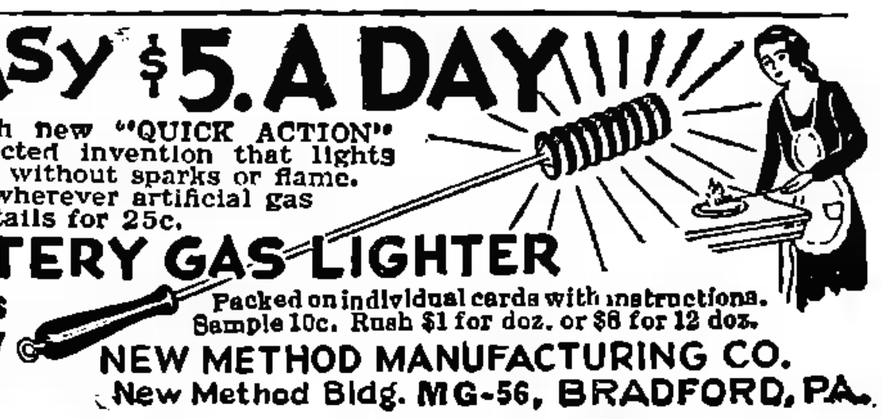

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$2.50 Breakfast Nook

[*Continued from page* 96]

lumber is wasted through boards splitting during the operation of knocking the packing cases apart.

After the necessary amount of lumber has been collected, plane and sand each piece smooth, first of course cutting the boards to their correct sizes. The benches are 47 inches in length and provided with seats having a width of 17 inches. From these dimensions, the builder will have little difficulty in making the back support pieces, legs and runners since they can be cut accordingly. The rear legs of the bench are 34 inches in height, or twice the height of the front legs, to permit simple installation of the two boards which form the back support. The tops of these pieces are tapered off to eliminate sharp edges and at the same time provide a neater design for the completed bench. Assembly of both benches and table should be done with flat headed wood screws, properly countersunk.

The table does not require any detailed explanation. A novel three-leg arrangement permits the table to stand perfectly rigid without inconveniencing breakfasters when getting in and out of the nook. The top of the table is built up from several planks, each securely screwed down to a pair of runners, to provide a table surface measuring 29 inches in width. The legs are made secure to the runners; two mounted on the end facing the wall and one located in the center of the opposite runner in the manner shown in the photographic illustration of the completed breakfast nook.

With all woodworking operations completed, apply a coat of flat paint to the table and benches, followed by two coats of quick drying enamel. After the paint has been allowed sufficient time for drying, an oil cloth top is installed on the table and fastened in place with half round molding. Cardboard backing, placed under the oil cloth, before it is tacked down, will provide the necessary cushioning and at the same time prevent any impressions of the boards from showing through.

The benches are provided with leatherette cushions, their construction being left entirely to the discretion of the builder. In making the cushions, the leatherette can be formed into removable pads or tacked down to the bench seats. For a very neat finish, removable pads are advised and while they will involve the use of slightly more material, the added cost will be well worth while.

Controlling malaria in the United States means chiefly fighting two types of mosquitoes that carry the disease.

Government scientists are trying to develop a kind of broom corn that will make good brooms and also will yield seed palatable to livestock.

Conditioning Your Sail Boat

[*Continued from page* 132]

craft leaked last season, you no doubt, traced the water to its inlet. Examine the faulty area closely. As the seams are somewhat open after the winter layup the leak may be apparent. Leaks are often hard to find because the water may come in at some distant spot and run along a seam before actually coming into the boat. A small check in a bottom plank may cause the trouble. Bore a 3/16-in. hole at each end of the crack and into these drive lightly, soft wood plugs dipped in liquid marine glue. Dress off each side flush and screw down a 1/4 x 1¼-in. batten somewhat longer than the crack inside. Then, working from the outside, fill the crack with one of the non-hardening seam fillers put up by the marine glue makers or with a wood preparation. Fillers such as putty harden and crack and do not give with the swelling of the wood. Keep the filler just below the surface for when the wood swells it will be crowded flush.

The leak may be traced to a faulty butt block. These are located inside the hull between frames where plank ends are joined. Examine their condition for rot or inability to hold the screw fastenings. If at fault, split out the butt block and use it for a pattern to shape another. Use plenty of glue when fastening the new one and be careful not to crack the ends of the planks when coming up on the screw fastenings.

Before attempting any caulking make sure the seams need it then proceed carefully. Use a single strand of candlewick dipped in glue forcing it into the cleaned out seam lightly with a putty knife and fill flush with seam filler. If you put off fitting out until too warm weather many of the underwater seams will open up. Do not caulk or fill these. If the boat was tight at these places last year it will be this when it swells—unless you leave it out of the water too long. Boats with open seams can be placed overboard to swell but they usually sink and have to be later pumped out or raised. To prevent the craft sinking use soft laundry soap or one of the waxes developed for this purpose. Simply wipe the soap or wax along the seam to keep the water out until the wood has a chance to swell.

Wonders can be worked with old boats by ironing muslin in hard marine glue over leaking spots or by using sheet lead patches. The glue treatment calls for carefully cleaning the faulty spot and surrounding wood of all paint and oil then brushing on glue heated until it works like paint. After the glue hardens lay a correctly shaped piece of unbleached muslin over the spot and press down with a hot flat iron. The heat sweats the glue through the fabric and allows you to smooth it out perfectly. After sanding and painting you have a permanent job.

Thin sheet lead patches are applied after coating the faulty place with liquid marine glue or

[*Continued on page* 141]

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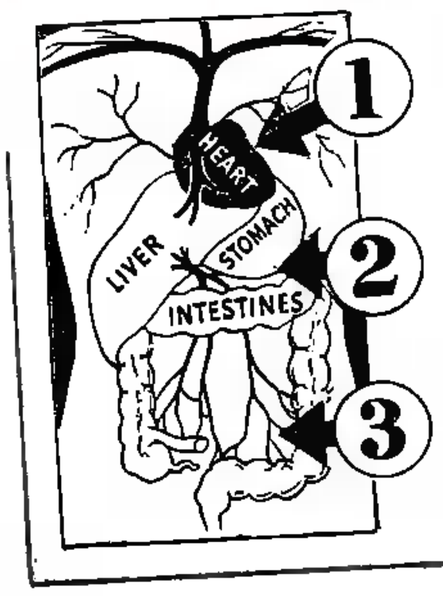

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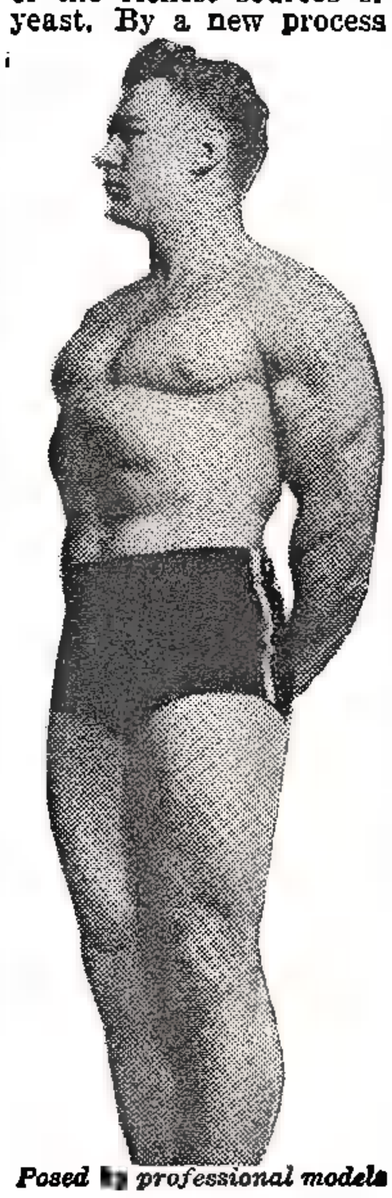

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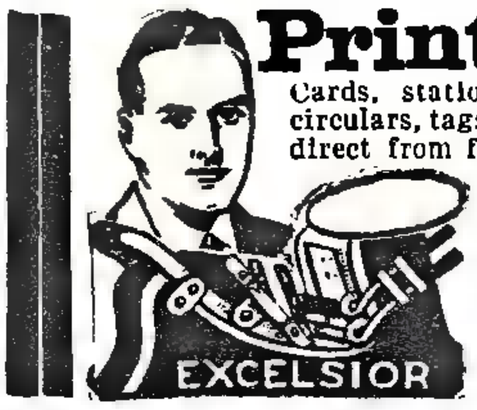

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Build Bellanca "Gas" Plane

[*Continued from page* 85]

line of thrust. Then tie a piece of very strong cord to the tail wheel fork (a piece of linen rib cord is ideal for this). Lay out approximately fifty feet of the cord along the path you expect to take. Warm up the engine, grasp the cord, and let her go. Follow it and feed the cord to it as fast as you can. At the first sign of any faulty adjustment, "throttle down" on the cord and force it to land.

Keep her well under control for the first few hops and only allow about a five foot altitude. Then increase the length of flights and the altitude till it shows no bad adjustment signs. You are then ready for a free flight. For this you'll obviously need an extremely large field such as an airport, and something, such as a photo timer, or a definite amount of gas, to limit the length of flights.

A few words of advice:

Keep the stabilizer angle as near zero as possible. Use the batteries for balancing and change the stabilizer setting only for different winds and power or other temporary changes.

When anything is broken on the ship, repair it before making any more flights. One part in slight need of repair may cause serious damage in what would ordinarily be a minor crack-up.

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Happy Landings!

All-Purpose Camera Stand

[*Continued from page* 112]

nails assemble the stem and cut a triangular block of wood 1-inch thick and fit it into the bottom end, then glue and nail this in place, countersinking and filling in all nail heads. When the glue has set round off the corners, sand smooth and using a sharp knife and a chisel recess a place, 1-inch from the top (open end) 3-inches long, ½-inch wide and $\frac{1}{16}$-inch deep, in one face of the stem. Now obtain a piece of brass 3-inches long, ½-inch wide and $\frac{1}{16}$-inch thick and drill a $\frac{5}{16}$-inch hole in the center. Solder a ¼-inch nut over this hole, place the metal piece in the recess in the stem and cut out for the nut so that the metal strip will be flush with the face of the stem.

The triangular center piece is of similar stock 2¼-inches on each side and 24-inches long. After cutting this piece out on the circular saw, round a 2-inch section at one end to snugly fit into a 3-inch length of 1-inch pipe which is threaded on one end. Taper the wood to form a blending intersection with the pipe using a wood rasp for this purpose. Remove the pipe and rout out a strip, ½-inch wide ⅛-inch deep, down the center of one face of the center-piece, drill a 22-inch length of ½ by ⅛-inch strap iron, every 2-inches with a $\frac{3}{16}$-inch drill and countersink these holes to receive flat head wood screws. Drill through the pipe also to match the end hole in the metal then replace the pipe and insert the wood screws as shown.

The legs come next. Six of these are required each measuring 1¾ by ⅞ by 28-inches. Using a shaper or a drawknife, shape the six pieces into a half round section leaving a rectangular section at the top 4-inches long. Now, using a 1-inch circular cutter in the circular saw, rout out a groove ¼-inch deep in each of the six pieces and sand these pieces smooth. Cut three 4-inch lengths of 1-inch dowel and glue these into the round grooves, matching

these between two of the leg pieces. When the glue has set, drive a few finishing nails through the assembly to secure the joint.

Drill each of the legs with a $\frac{3}{16}$-inch hole and then cut three 12-inch lengths of 1-inch dowel for the foot pieces. Rubber cane tips may be used on the ends of these or, if desired, rubber head tacks may be used.

From bakelite or fiber $\frac{3}{16}$-inch thick, such as old radio panel, cut three pieces 1¼-inches wide and 11-inches long and round the ends with a file.

The metal height adjustment clamp is made next. From brass or aluminum cut a strip ¾-inch wide and about 10-inches long and bend it around the triangular stem. Now place the metal strip in the recess cut for it, with the nut inside, and drill the band and the strip to receive the wood screws. Exercise care to get the locations of the screws absolutely correct so that they will not come through the inside of the stem. Obtain a ¼-inch wing bolt at a hardware store to form the adjustment screw.

The metal stem clips are of ⅛-inch aluminum or brass ¾-inch wide and about 4½-inches long, bent around the stem piece and then at right angles to fit the leg pieces. Three of these pieces are necessary and are assembled to the leg pieces as shown with $\frac{3}{16}$-inch bolts and wing nuts. This assembly should clamp around the stem tightly. The clips to hold the foot pieces securely are of brass or aluminum ¾-inch wide ⅛-inch thick and about 8-inches long. Three of these are required and the ends are rounded and drilled $\frac{3}{16}$-inch for bolts and wing nuts to be inserted.

The clamps for the bottom of the stem are similar to the leg clamps, but are longer and these are assembled to the bakelite pieces with wing nuts and bolts. Insert round head stove bolts through the holes in the center of the leg pieces and bakelite strips between the leg halves, slipping a rivet over the bolt to retain the nut. Now slide the stem through the clamps and tighten the wing nuts, insert the triangular center piece inside the stem and tighten the wing bolt to hold it in place.

The tripod head is made last. The tilt top is of wood, 6-inches wide, 1-inch thick and 9-inches long, rounded off at the corners. Drill this piece on the center line to receive the thumb screw of your camera. The panoramic base is of similar stock 6½-inches long. Drill this piece through its width with a ¼-inch drill, 2-inches from the end. Drill a 1-inch pipe floor flange and tap the hole for a lock screw such as can be obtained from an old "C" clamp. Wood screws hold the flange to the center of the base piece. Two small brass hinges are used to tilt the top. Obtain two brass desk hinges about 7-inches long and screw these to the top as shown. Using washers on each side of the slots in the desk hinges, insert a ¼-inch bolt, 6½ or 7-inches long and add a wing nut. Now screw the head assembly to the pipe in the center piece to complete its construction. The camera tripod can be enhanced to a considerable extent by applying a coat of natural stain, followed by a coat of varnish, to all wooden parts.

Double Unit Floodlight Case

[*Continued from page* 132]

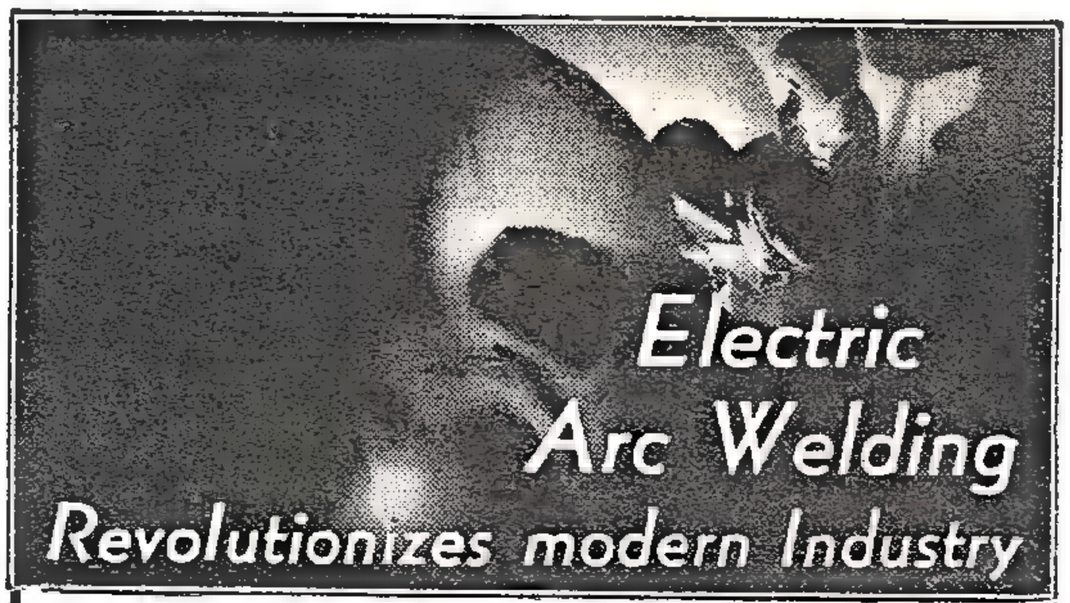
strips of wood in the back, over the rear reflector, the side reflectors can be securely tacked into place.

After completing one half of the case, by installing two porcelain cleat type sockets and wiring them to a suitable rubber covered fixture cord, the remaining half of the case is duplicated in the same manner.

Before completing the case, by painting with a good grade of enamel and fitting with a carrying handle and brass hooks for holding the case intact, provision for hanging the diffusion screens must be made. The screens are nothing more than pieces of thin silk, hemmed at each end to permit the insertion of metal rods for drawing out the wrinkles in the cloth. The upper rods are suspended on hooks made from two No. 127 film spools.

Remove the metal disc from one end of each spool and trim down the disc on the opposite ends of the spools to form a hook. Next, in the upper

[*Continued on page* 140]



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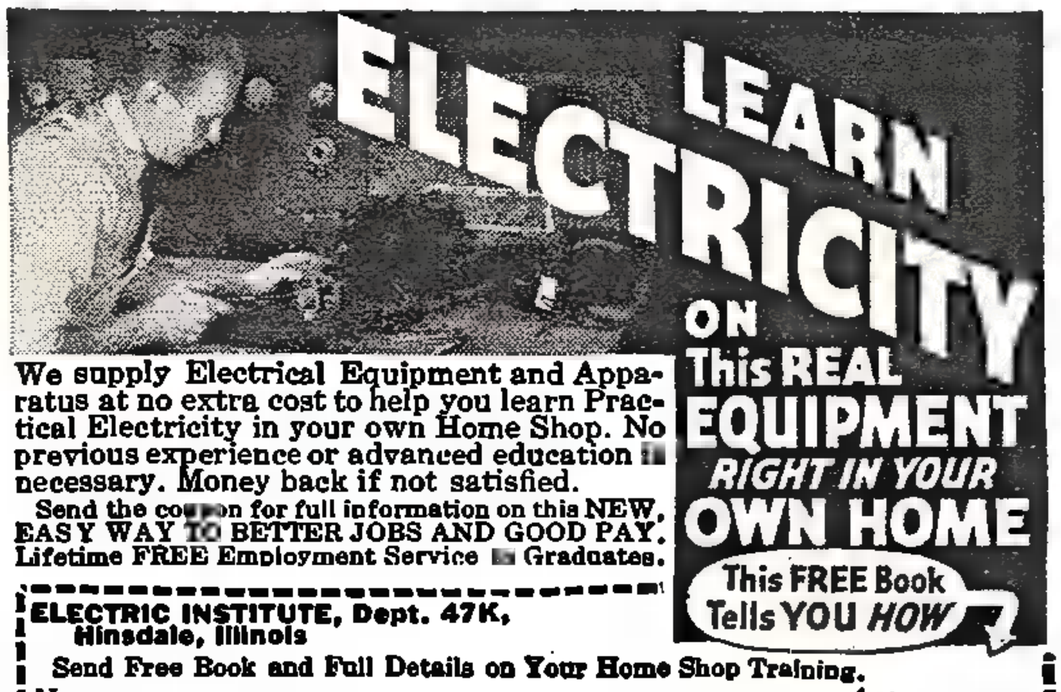

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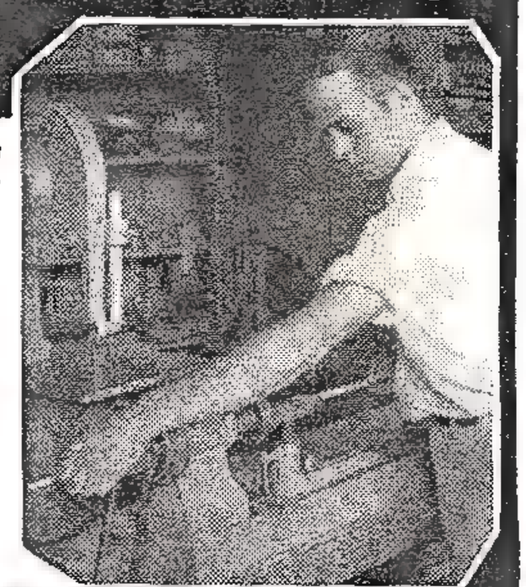

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Scan The Sky With Telescope

[*Continued from page* 79]

The tool is rigidly fastened to the table G. The machine is driven by one-fourth horse-power electric motor R.

These are all the features needed for simple grinding. F is a block of wood which is fastened to the mirror. The machine should be so lined up that each stroke of the mirror is equal to one-third the diameter of the tool.

The pulleys P and P′ are used in spot grinding, which is in itself an advanced process. The pulley P is rotated by the shaft O when it is centered by being moved along the slot I. A belt between it and the pulley P′ drives the latter at whatever speed is desired. Spot grinding, however, is a technical operation which should not be attempted by the beginner.

The bearings, gears and shafts used in this machine may be adapted from old automobile or washing machine parts, and stray bits of old machinery, or they can be purchased from a reliable gear company.

There are a few general hints which apply both to machine and hand grinding.

First and most important, be clean. Don't be sloppy. The dirty workman may expect nothing but disappointment.

Second, don't take too long a stroke. This is liable to result in a turned edge.

Third, don't allow the mirror to be subjected to too great changes in temperature. For this reason, a basement is the best place to work. Always test your mirror at a constant temperature. Wait thirty minutes after grinding before testing, to allow the mirror to cool.

Fourth, in roughing out the center of the curve by hand, grind slightly off center so that the edge of the tool will pass over the center of the mirror. Be sure to test often while using this technique, as the work progresses rapidly.

Fifth, it is a good plan to finish the grinding with a little optical emory mixed with precipitated chalk. The chalk will prevent sticking.

This article has described the rough and fine grinding. Your flat piece of glass has now become concave. It should be close to the desired focal length. It must now be polished, silvered, and mounted. These steps will be taken up in the next two articles.

Double Unit Floodlight Case

[*Continued from page* 139]

corners of the case sections, drill holes large enough to permit the insertion of the wood dowel sections of the film spools. Make these holes sufficiently large so that the dowels will slide in and out freely.

The slots in the dowels, through which the film was originally threaded, are used to advantage since they provide a means whereby the hooks are free to move in and out without accidentally falling out and becoming lost. Slide the dowels into the holes so that the slots are in a horizontal position then drive small escutcheon tacks through the side of case to provide a stop for the hooks. Installed, they permit the diffusion screen to be hung in position in a moment. When transporting the reflector, the hooks are pushed flush with the edges of the case and the silk screens rolled up and placed inside along with the fixture cords.

Conditioning Your Sail Boat

[*Continued on page* 137]

white lead. Lay a flannel patch over this, then apply another coat of glue and place the patch in position and fasten down with copper tacks. The soft lead can be beaten down around the edges and into odd corners to blend in with the planking contour. Make sure that the patch is large enough so that the tacks enter firm wood surrounding the faulty spot.

Seams, cracks and dents above the waterline should be filled with plastic wood or a mixture of white lead and putty. Whatever is used, mix a little of the topside paint with it so that if the regular finish wears off such puttying will not be apparent.

The condition of the painted surfaces will govern the treatment necessary. Removing paint is a hard, tedious job no matter how you do it. If the surface is merely dulled, rub with steel wool; if cracked sand down well, but if scaled loose in patches scrape or burn off the old paint. A professional can do wonders with a blow torch and putty knife and you can master the knack fairly easily for it is the quickest way to remove paint. The torch must work perfectly and the day be without wind. The alternative is to use a small three cornered boat scraper which must be sharpened constantly with a file to work easily.

A painted surface once scraped off must be refinished slowly. Not by heavy paint, but by at least three coats, the first well thinned with turpentine, the second thicker and the final one as it came from the can. Varnish is more a matter of adhesion to the wood than of penetration and can go on thicker. Different paints require different treatments and there is no excuse for a poor job as marine paint makers issue free informative literature for amateur painters. Before you commence fitting out decide to use one reputable firm's paint, write them for literature and then follow instructions to the letter rather than listen to well meaning friends.

Wash canvas decks and covered boats and canoes with strong soap powder or paint cleaner to remove loose color, oil and dirt. Do not remove paint unless absolutely necessary. Spend plenty of time preparing for the final painting. Scale off loose paint and try to blend surrounding surfaces into these by sanding well. Paint such spots first with several coats to build them up to the surrounding level. A very thin mixture of putty and white lead colored with paint to be used should be putty knifed into cracks and depressions after sanding.

Tears and rents respond to the hard glue treatment. Apply the glue sparingly and sand afterwards so that spots are not noticeable after final treatment. Use thinned deck paint or it will check when the canvas gives and takes with walking. Only a regular marine paint developed for CANVAS decks will withstand the give and take of the fabric. Ordinary household porch

[*Continued on page* 150]

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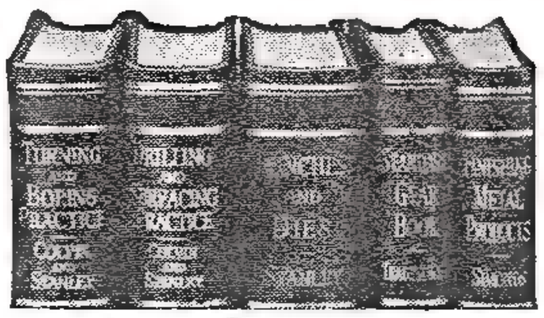

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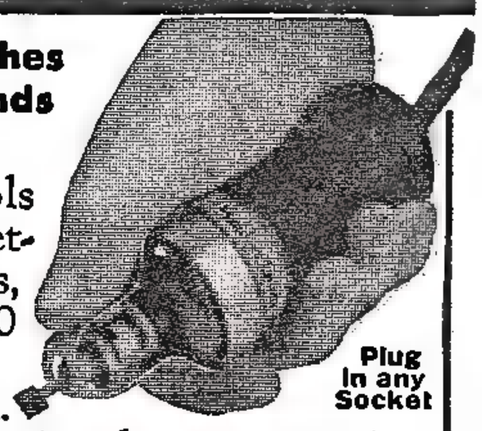

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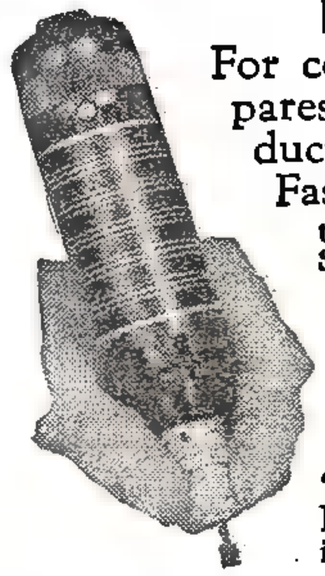

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Home Camera Stunts

[*Continued from page* 107]

out introducing elaborate details. Here are a few suggestions for the materials:

White or light gray cardboard makes "sky"; a mirror makes a lake; twigs and small plants make trees and hedges; moss serves for grass; chalk, salt or flour for snow; toy automobiles, trains, boats, airplanes, houses, human and animal figures may be obtained at the five-and-dime store. If you are handy with tools, you can fashion various "props" yourself, using soft wood, or you can use plastic modeling materials.

A few points relative to the photography:

Working at close range, the depth of field of the lens is not likely to be great, so, in building your set, keep the elements within as short a distance, front to back, as possible. You get the best effects by using the lens at a small opening. Better make about three "shots" of a setting, varying the exposure time, to be sure of obtaining a perfect negative.

Two No. 1 size photoflood bulbs in reflectors will provide ample light. As a guide in making the exposures, figure about 8 seconds with stop f. 32 with "chrome" or fine-grain type films, with the scene about six feet from the camera. Modern film has considerable latitude, and will yield almost identical prints from exposures several hundred percent different from the ideal exposure. In all cases it is better to overexpose a little (give more time) than to underexpose.

Photography has been called the art of painting with light, so do not hesitate to experiment with the placement of your flood lights and reflectors. Sometimes a single lamp will produce the effect you want. Again, you may want one figure or part of a scene to stand out brilliantly, with the rest of the setting subdued. For this, a large piece of cardboard with a hole in it will provide an emergency spotlight. You can use ordinary bridge lamps for the reflectors if you block the open section at the top with black paper so that no light strikes the lens directly. In all photographic work, the idea is to have the camera register the light reflected by a scene, and to eliminate stray rays from the actual light source.

If your camera has a ground-glass back, you will have no trouble "composing" the scene before inserting the film pack of film holder and making the exposure. If your camera is of the roll film type, you will have to depend on the small "view finder." At very short range this finder is likely to be a bit inaccurate, so it is a good idea to back the camera away an extra foot or so to be sure that everything you want to "shoot" is included.

The use of a tripod of some sort is imperative for indoor "still" photography, as the exposures will be at least several seconds long. It is also advisable to protect the lens of the camera from stray light by means of a suitable snap-on shade. Such shades are easily made or cost only a few cents in any photo supply store.

OUR SENSATIONAL NEW 1937 CATALOG NOW READY! NEARLY 600 PAGES OF UNUSUAL NOVELTIES..SEND 3c FOR IT!

BROADCAST *thru your radio* TALK - SING - PLAY

BROADCAST your voice on programs coming through your own radio set—make announcements from any part of the house—inject wise cracks, josh and mystify friends. Imitate radio stars, practice crooning, singing, radio acting, etc. Do a "Ben Bernie" or a "Rudy Valee."

World Mike

Made especially for home use, attached in a jiffy without tools. **Not a toy.** Put on your own programs at home, parties, club affairs, etc. Barrels of fun! Easy to operate.

Price Postpaid 25c

DELUXE MIKE

Large, substantial, all-metal mike. Practise radio singing, broadcasting, programs, etc., thru your own radio. Reproduces voice in loud, clear tone without distortion. Regular table model—can be held in hand. Guaranteed. Connected without tools. Price 75c

MIDGET POCKET RADIO $1.00

Listen to Music Programs and Sports Everywhere You Go—Loud Tone

Beautiful clear tone while you walk! The amazing midget pocket radio gives you all the entertainment of a radio wherever you are—in the country, office, on a boat, in a car hotel, in bed, on bicycles. **ANYWHERE** and **EVERYWHERE**. Size of a cigarette pack, yet it operates perfectly. Beautiful clear tone. Range, 50 miles. No static or noise. No batteries, no tubes, no crystals to adjust. Just one moving dial to locate stations. New sensitive rectifier and high efficiency design.

Not a toy. Price Postpaid $1.00. Earphone, 89c. Phone & Radio Set $1.79.

Wireless Transmitter Broadcasting Set $1

First again! First with the low-priced crystal radio, then the famous World Mike, then the All Wave World Wide Radios, then the Dollar Pocket Radio, and **NOW** a genuine RADIO TRANSMITTER that sends out messages by wireless, for only $1.00, plus 10c postage. Note these sensational Features:

- ★ Can be picked up on a suitable Radio Receiver
- ★ Not a Mike, but a complete Broadcasting Set
- ★ Complete with Key, Kit Form
- ★ Plugs in to any AC-DC circuit
- ★ Uses 2 oscillating tubes

Complete Transmitter, $1.00 plus 10c post. Tubes (uses 2) Each 50c

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A Private Electric Telegraph set for only 15c! Use it as a practice set or send messages to friends (sending and receiving). Learn the code easily and quickly. Be an expert operator. Key, sounder, magnet, etc. mounted on wooden base, complete with Western Union blanks, code and instructions, (without battery) All for **15c**

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YACHT CAPS 25c

Smart, snappy. Just what every real boy is wearing. Cool and comfortable. **White Twill Yacht Cap**, with black oilcloth peak, sweat band, gold braid and brass buttons with anchor. Price **25c**

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CHAMELEON 25c

A LIVE PET

WATCH IT CHANGE COLOR!

Get one of these most wonderful of all creatures. Watch it change color. Study its habits. Wear one on the lapel of your coat as a curiosity. Shoots out its tongue to catch flies and insects for food. No trouble to keep. Can go for months without food. About 4 in. long. Shipped to any address in USA by mail. We guarantee safe arrival and live delivery. Only 25c

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HOW TO WIN PRIZE CONTESTS

Tells the best methods and principles for winning some of the big prize contests which are announced almost daily. People make tidy sums of money by solving the various contests. Methods and principles presented have been selected from those advanced by the winners of some of the hardest and largest contests staged thus far. Price 10c. 600 page Novelty Catalog, 3c

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326 Jokes & Riddles, 25 Tricks, 10 Parlor Games, 73 Toasts, 13 Stories, 105 Money-making Secrets, 22 Monologs, 21 Puzzles, Problems, Comic recitations, Funny Readings, 10 Parlor Pastimes, 13 Flirtations, 1000 Names & their Meanings, 10 Picture Puzzles, 37 Amusing Experiments, Deaf and Dumb Alphabet, Shadowgraphy, Fortune Teller, Fortunes with Cards, Crystal, Tea Cup, etc., Hypnotism, Ventriloquism, Cut-outs for Checkers, Chess, Dominoes, Fox and Geese, 9 Men Morris, Anagrams, 25 card Tricks, Crystal Gazing, etc., etc. Only **15c**

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Funniest novelty ever invented! Fits the finger like a ring, but concealed in palm is the TICKLER. The Buzzer, or tickler, contains a clockwork mechanism that is wound up. Whenever it is touched, the mechanism is released, giving the victim a shock. Every time you shake hands, your friend will get a violent shock. Touch them on the back, and watch them jump. They will hit the ceiling if they sit on it. Under a sheet it feels like a mouse. Use it as a "tic-tac" on window. Hundreds of uses. ONLY.... **26c**

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Contains everything needed to alter the face to represent any character: the Beautiful Heroine, the vicious Villain, the Charming Beau, the Comic Old Lady, the Clown, The Hobo, the Negro Minstrel and many others. Just a few touches and the expression is entirely changed so that even your intimate friend will not know you. Amateur's Make-Up Kit. Price... **$1.00**

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FUN LICENSES 10c

Large size, nicely printed with seal suitable for framing and one of these is your friend and it will never fool you. Your choice:

Doctor Certificate
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Price 10c each license. Any 3 for 25c.

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Four unique lighters at the low price of 15c each. Full sized pencil&lighter; key; Bullet; and one which looks like a Cigarette—will fit into your cigarette case! Lights every time. Your choice ONLY **15c** Flints 3—10c

Pencil Bullet Cigarette Key Your Choice!

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Remarkable results—simple operation—low prices! 15 to 600 meters. Gets police calls, foreign stations anywhere, code, short wave, foreign and domestic broadcasts, etc. with remarkable volume and efficiency. Each set complete without tube, phone, battery or aerial.

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Wired, ready to operate. $2.30.
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CRYSTAL RADIO 25c

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LIGHTS IN ANY WEATHER

Famous Wind Lighter now being offered at a price lower than ever before. Brass in bright nickel finish, with sliding cylinder. When in use the flame is protected from the wind and can be used in almost any weather. Length 3½ in. Few lighters are so reliable and so all-round useful as this one. Ring attachment on end so it may be attached to watch chain. Automatic Wind Lighter.. 25c
Extra Flints. 3 for 10c.

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5 PIECES

Consists of 1 Harmonica, 1 Warbler, 1 Humatone, 1 Kazoo, 1 Flute, with complete instructions. Play Hill Billy songs, Mountain, Cowboy, Negro, Popular, Dance, etc. music. At the beach, on picnics, at home—EVERYWHERE. And boy, oh boy can you go to town! Get five fellows and let 'er swing. Hill Billy Band Set **15c**

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2 inch Crystal..... $1.00
3 inch Crystal..... $2.50
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Crystal Stand..... 75c

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Popular Designs

Three sensational brilliantly glazed, imported china novelties. Bright colors, snappy designs. Your choice: Outhouse Novelty 15c. Ash Receiver (center) 25c. China Toilet (right) 15c. All Postpaid.

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Roll your own and save money. Better and quicker—saves more than half. Neat, useful, handy. Pocket size, weighs 1½ ounce. Nickel plated metal. Price Postpaid **25c**

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These Cigarette Stinkers can be placed in any cigarette so they will not be noticed, yet when the victim lights up and takes a few puffs, the cigarette throws off an awful "stink." A good joke for moochers. 8 Stinkers 10c

LUMINOUS PAINT

LUMINOUS PAINT, when applied to an object, emits rays of white light, rendering it visible in the dark. The darker the night—the brighter it shines. Simple to use—you can do it! Apply some to the dial of your watch so you can tell time at night. Paint pushbuttons, switches, anything, everything with it. Small Bottle, 25c. Medium size 50c. Large size $1.00 postpaid.

Resurrection Plant

Great curiosity. Place in water, plant opens up and starts to grow in a few minutes. Taken out it dries up and goes to sleep until put in water again. Lasts almost forever. Brilliant green when growing. Each, 10 cents, 3 for 25c.

INSERT A COIN AND OUT COMES A DELICIOUS CHOCOLATE BAR

Thrift Bank and Slot Machine

FREE! This sensational new-type bank is yours—yours to have and to hold—without any cost. Just think of having this handy bank around and as a penny, nickel or dime is dropped in—out comes a chocolate bar, all wrapped up! Leave the bank around the house and you'll find that it fills up with money while you're gone.

HOW TO GET YOUR BANK FREE!

This slot-machine bank cannot be bought. There is just **one way to get it**—send $1.00 for 70 chocolate bars and we will include **the bank free!** Made of sheet metal with regular locked door so you can open, remove money and refill with chocolate. On the front is a slot to drop coin in, and a glass window showing bars, Red, yellow and green. Send a dollar bill ($1.00) for the 70 bars and get the bank **FREE.**

EXTRA! If you hurry, we'll add, without cost, our big 1937 600-page novelty catalog, 3500 illustrations.

THRIFT VAULT

A real safe lock and Vault Bank. Just dial the three numbers and open the vault just like any safe. Big and roomy—it measures about 4x3 in. Swell to keep your money, jewelry, etc. In. Constructed of heavy metal with red and black trimmings. Full instructions with each bank. VAULT BANK only 50c postpaid.

THRIFTVAULT Similar in appearance to the above only made of welded steel, and slightly larger. Packed in a box, with complete directions for opening. Price, ppd. **$1.25**

50c

POP EYE Knockout BANK

Big, jumbo 3½x2½x3" bank with regular boxing floor and two figures, Pop-Eye and his opponent. Each and every time a coin is inserted in the bank, the fight begins, and Pop Eye delivers a terrific KO punch, flooring his opponent! Friends, neighbors and relatives put money in your bank just to see the fight. Lithographed in colors, with lock and key. Price Postpaid **25c**

BlankCartridgePistol 50c $1.00

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Looks Like A Real Revolver

Strongly constructed with a flashy nickel finish. Has dip barrel that allows the cartridges to be loaded in a second. **Medium size, Large size $1.00. Blank Cartridges 50c per 100. Holster (Cowboy Type), 50c. SHIPPED BY EXPRESS, NOT PREPAID.**

6 Shot Automatic

Blued steel 6-shot automatic blank pistol. Fires blanks only. Looks exactly like expensive automatic. Shipped by express, not prepaid. Price $5.30. Uses special cartridges, 75c per 100.

Open Any Lock

Did you ever lose or to get your keys! Probably many times. Don't worry any more about lost keys (or any keys, for that matter), as these master keys will open most ordinary door locks. Five different keys for various types of locks. Will save their cost if you only use them once, but you'll probably find them so handy that you'll always carry them

5 MASTER KEYS Price 25c

Good Luck Ring

Very striking, quaint and uncommon. Oxidized gun-metal finish; skull and crossbones design; two brilliant flashing imitation rubies or emeralds sparkle out of the eyes. Said to bring good luck to the wearer. Only 25c.

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It looks like a deadly weapon, but it is merely a novel Cigarette Case. Better than the real thing in many an awkward encounter. Great fun "sticking up" your friends. They squirm and protest. Pull the trigger and the slide flies open, disclosing cigarettes. Price **25c**

HOW TO TAP DANCE

PRICE 25c

Why envy the easy rhythm and fascinating grace of Step'n Fetchit, Fred Astaire etc. Tap dance in ONLY HOUR by a new simplified course by Prof. Wilson. No special ability needed. Be smart! Everybody's tapping. The whole town is tapping. Beat out a tune with your feet.

310 Illustrations

Hostess sees love it. Friends adore it. Besides, tap dancing is not only invigorating and entertaining but is also a healthful exercise for making the limbs supple and giving a "springy" feeling of fitness to the whole body. Promotes slimness nature's way—no pills, drugs or dieting. Readers say: "...wonderful benefit. Thank you for adding tap dancing to my accomplishments." Price 25c postpaid.

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OVER 101 ILLUSTRATIONS

LATEST STEPS. Be popular. Good dancers are always admired—always popular guests. Partners welcome them eagerly. The newest, smartest steps without a teacher. Don't make excuses when the music starts. Get lots of fun from parties and dances.

If you want to become a perfect dancer, learn to dance at home this new easy way. **BOOK TELLS:** How to develop poise and control, improve your dance steps, art of holding, how to walk to music, how to lead, latest fox trot steps, Natural and Reverse Turns, the Reverse Wave, The Quickstep swaying to music, Waltz, Backward changes, the Continental, The famous Kiss dance, the Martinian, the College Rhumba, the Carlo, Charleston, etc. Art of Dancing 25c

25c

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into a trunk, under the bed or anywhere. Lots of fun fooling teacher, policeman or friends.

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A little instrument, fits in the mouth out of sight, used with above for Bird Calls, etc. Anyone can use it. Never fails. A complete book with full course on Ventriloquism together with the Ventrilo. Sent postpaid for only..... **10c**

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The Japanese art of self-defense. New methods of attack and defense are given. Illustrated so that you cannot fail to understand them. Deals fully with trips, throws, wrist locks, body holds, defense against revolvers, strangling, armlocks, scissors, splits, headlock, holding a man down, double knee throw, stick attack, defense against knife, one hand throat grip, defense against two assailants, stomach throw, secret thumb knockout, nerve pinches, and numerous others. Learn to protect yourself under all circumstances with nature's weapons. Fear no man, guns or knives! "Science of Ju Jitsu" Only 30c.

WONDERFUL X-RAY 10c

GREAT CURIOSITY! With it you can apparently see the bones in the fingers, lead in a pencil, even the flesh seems transparent. Always ready for use. Only 10c ppd.

Rolmonica Automatic Mouth Organ $1.10

An automatic harmonica that plays a music roll just like a player piano. A whole brass band all in one—the biggest sensation in the musical world in the last few years. Just insert a roll and turn the handle while you blow. Nothing could be simpler. All kinds of melodies. There are hundreds of rolls to select from: My Blue Heaven, Sidewalks of New York, Yankee Doodle, Over the Waves, My Wild Irish Rose, Merry Widow Waltz, Rose Marie, Old Man River, Twelfth Street Rag, Alexander's Rag Time Band, Hinky Dinky Parlez Voo, Make Believe, La Paloma, Turkey in Straw, Hot Time in the Old Town Tonight, Wabash Moon, Waltz You Saved for Me, Lazy Bones, I Saw Stars, Home on the Range. Each extra roll, 40c. Rolmonica with 1 roll... **$1.10**

Sensational Photo Ring

Your picture or your friend's picture slips neatly under top frame, making photo ring that is surprisingly smart looking. Snappiest, classiest ring out. Same ring sells for $1.25 in New York. Beautiful silver appearance with heavy set, chased mounting. PHOTO RING. Price.... **35c**

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Whoopee Cushion is made of rubber, inflated like a balloon, and then placed on a chair, couch, seat, etc. When the victim unsuspectingly sits upon the cushion, it gives forth noises that can be better imagined than described. Price.. **25c**

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ELECTRITE PENCIL

Writes in Gold on Any Article

Electrite Pencil writes in gold, silver, red, yellow, purple, green, blue, etc., on leather, wood, paper, bakelite, cellophane, silk, rubber, etc., etc. Put your name, monogram or initials in gold or any other color on your car, wallet, golf clubs, fountain pen, stationery, etc. Print and decorate anything. Live-wire boys and girls can earn extra cash easily by doing this for other people. Every time you print a name or monogram on an article you can easily get 25c for it, yet it costs almost nothing except few seconds time! Easy to use. Just plug into electric light socket and the pencil is ready to write. ELECTRITE PENCIL, complete with supplies. ONLY..... **$1.25**

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Quartermaster • Navy • CCC • Marine • Army Ring

Big jumbo size, with a flashy emblem, surrounded by the American Eagle. Like the U.S. Government men wear! State type and size. Silver Finish, Sterling Silver, $1.00. 14 kt. Gold Ring, $1.75. **25c**

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Complete blueprints for 3 different racers. The one illustrated can be built for a few dollars. All about racer parts, gears, transmissions, dirt track racers, track regulations, blueprints, plans. ADD A MOTOR TO YOUR BIKE at low cost. Increasing speed, etc., etc. Crammed & jammed full of information

25c

Over 75 Illustrations, plans & blueprints. COMPLETE BOOK only 25c.

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Perpetual Rose Bush seeds produce one of the most amazing varieties of the rose ever developed. May be sown either indoors or outdoors and blooms the first year it is planted, and when three years old, the bush is a mass of roses. Three Shades—white, pink and crimson. WE GUARANTEE IT TO PRODUCE SPLENDID FULL SIZE ROSES. Blooms regularly. Packet, 10c

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RADIO & TELEVISION BOOK. How to build experimental sets, etc. Complete construction diagrams, information, etc. 10c

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Rate for classified ads, 18c per word (include name, address and all numbers), per insertion. Minimum 10 words. Cash must accompany order and be received in this office July 3rd for the September Issue (on sale July 28th). Address Classified Mgr., Modern Mechanix Hobbies & Inventions, 1501 Broadway, New York City.

A. C. GENERATORS

PRACTICAL changes for automobile generators. See our advertisement at bottom of page 125. Autopower.

ADVERTISING AGENCIES

LEARN Advertising quickly at home. Easy practical plan. No text books. Common school education sufficient. Interesting booklet and requirements free. Page-Davis School of Advertising, 3601 Michigan Avenue, Dept. 204C, Chicago.

ADVERTISE: Get mail-order business, agents. Free assistance. Free Ad-Guide of newspaper, magazine, circulations, rates, mailing-lists. Chicago Advertising Agency, 22 West Jackson, Chicago.

33 WORDS, 25 magazines, three months $2.00. Goodall Agency, 742 Market, San Francisco.

FREE NEW advertisers rate guide. Brown Advertising Agency, 140 South Dearborn, Chicago.

AGENTS WANTED

NEED Money Quick? Here's a genuine opportunity to make up to $42.50 in a week. Operate grocery business from your own home. Supply friends, neighbors, others. I send complete outfit on 30-day trial; no money risk. Details free. Albert Mills, 2349 Monmouth, Cincinnati, Ohio.

AGENTS: Smash go prices. Santos Coffee 12c lb. 4-oz. Vanilla 8½c. Razor Blades 10 for 8½c. 100 Sticks Chewing Gum 12c. Christmas Cards, 21 in box, 14c. 150 other bargains. Premiums. Experience Unnecessary. Carnation Co., MN, St. Louis, Mo.

BIG MONEY and Fast Sales. Every owner buys Gold Initials for his auto. You charge $1.50; make $1.45. Ten orders daily easy. Write for particulars and free sample. American Monogram Company, Dept. 11, Dunellen, New Jersey.

DOLLARS in savings and sales from semi-diesel conversion units for all auto, other gas engines, factory built. Low as $5. Guaranteed on trial plan. For details write Dies-L-Gas Sales, 420 Market, San Francisco.

BIG Money Applying Gold Initials on Automobiles. Easiest thing today. Free Samples. Also, Sideline Salesmen for Name Plates and Tire Cover Transfers. "Ralco", 1084 Washington, Boston, Mass.

PROFIT with new products. Make, sell, repeat. Analysis. Research. Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, CE-1142 Sunnyside, Chicago.

GOLD Reflecting Window Sign Letters. Penny Each. Large Sizes. Easily Applied. New Styles. Absolutely Beautiful. Free Samples. Atlas Sign Works, 7941-G Halsted, Chicago, Ill.

AGENTS—Erco Hand Cleaner will build you a steady repeat business. Details on request. Erion Manufacturing Company, 32 Erie Boulevard, Schenectady, New York.

1000 BARGAINS, Drygoods, Notions, Drug Sundries, Specialties, Novelties. Agents undersell stores. Free catalog. Jobbers, Dept. 2098-A, 930 W. Roosevelt, Chicago.

YOU'LL Like Resilvering Mirrors, Autoparts, Reflectors, Making Chipped Glass Signs. Write Sprinkle, Plater, 850, Marion, Indiana.

AGENTS' Gold Sign Letters for store windows. 500% profit. Free sample. Metallic Letter Co., 426 N. Clark, Chicago.

EARN $20 to $100 weekly operating your own business from home. Elco Publishing Co., 507-A 5th Ave., New York.

WANTED: Chromeshine Polishing Cloth. Sample Stamp: Kaplan, 13 S. Eden, Baltimore.

SELL Novelty fun cards, novelties, etc. Samples, list 10c. National Box 500H, Cincinnati.

AMERICAN POLICE JIU JITSU

13 KNOCKOUT Blows without use of fists, by internationally famous Jiu Jitsu instructor. Send 15 cents. S. J. Jorgensen, 284 Maritime Building, Seattle, Washington.

AUSTRALIAN OPALS

OPAL Bracelets, dozen stones, very beautiful $17.00. Catalogue free. Seward, Optician, Melbourne, Australia.

AVIATION

GET INTO AVIATION. Air transport pilots get up to $7,000 per year; mechanics, $2,500. Learn at this Government approved school. Write for complete information. State age. Lincoln Flying School, 4002 Aircraft Bldg., Lincoln, Nebr.

AEROPLANES, New Production, $98.00. Easy payments. Propellers for aeroplanes, boats, sleds, wind-driven generators, $2.50 up. Send 25c for more information. Universal Aircraft Co., Fort Worth, Texas.

AVIATION mechanically inclined young men desiring positions as airplane mechanics write enclosing stamp for reply. Aviation Personnel Service, 72 Monroe, Williamsville, New York.

INEXPERIENCED workers, apply for aviation jobs now. Full salary while learning. Details for stamp. Airployment, Box 553, West Los Angeles, California.

AIRPLANES, $50 up. Terms. Crack-ups, salvage. Directory 25c. Aircraft Directory, Athens, Ohio.

AMBITIOUS Young Men interested in entering Aviation as Apprentices, see ad on page 134.

BLUEPRINTS

METAL TUBE Midget Radio, the last word in compact radio receivers. You can construct this set even though your knowledge of radio is limited by following the large pictorial blueprints available, from Modern Mechanix Publ. Co., Greenwich, Conn., at 50c postpaid.

$700 BUYS all materials for your home. Send 25c for design folder, details. Dana Co., Box 1381, Indianapolis, Ind.

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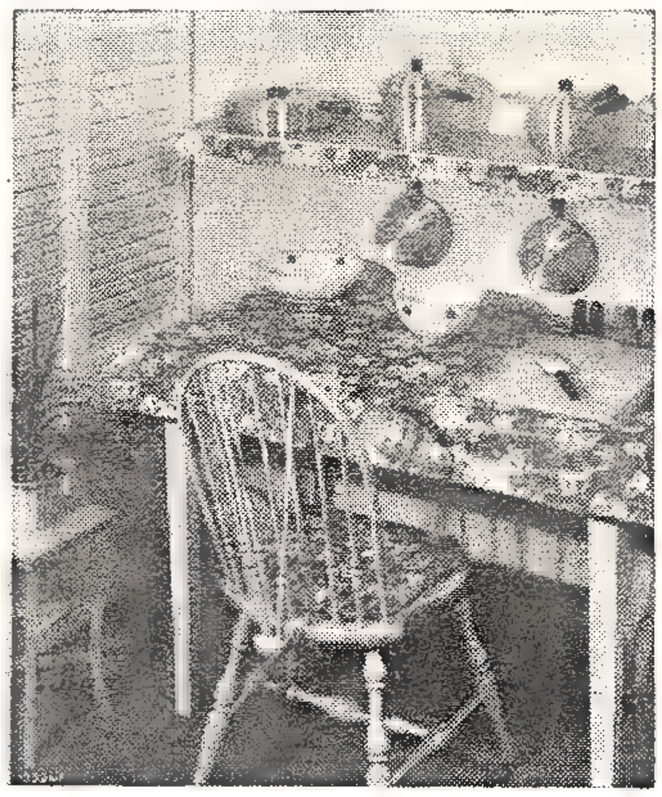

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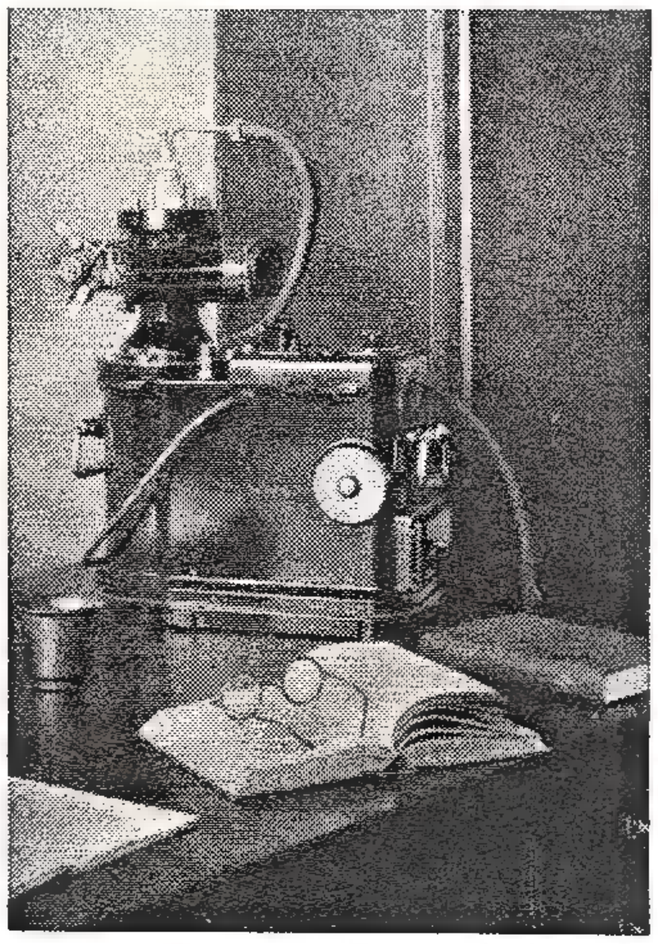

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PATENTS

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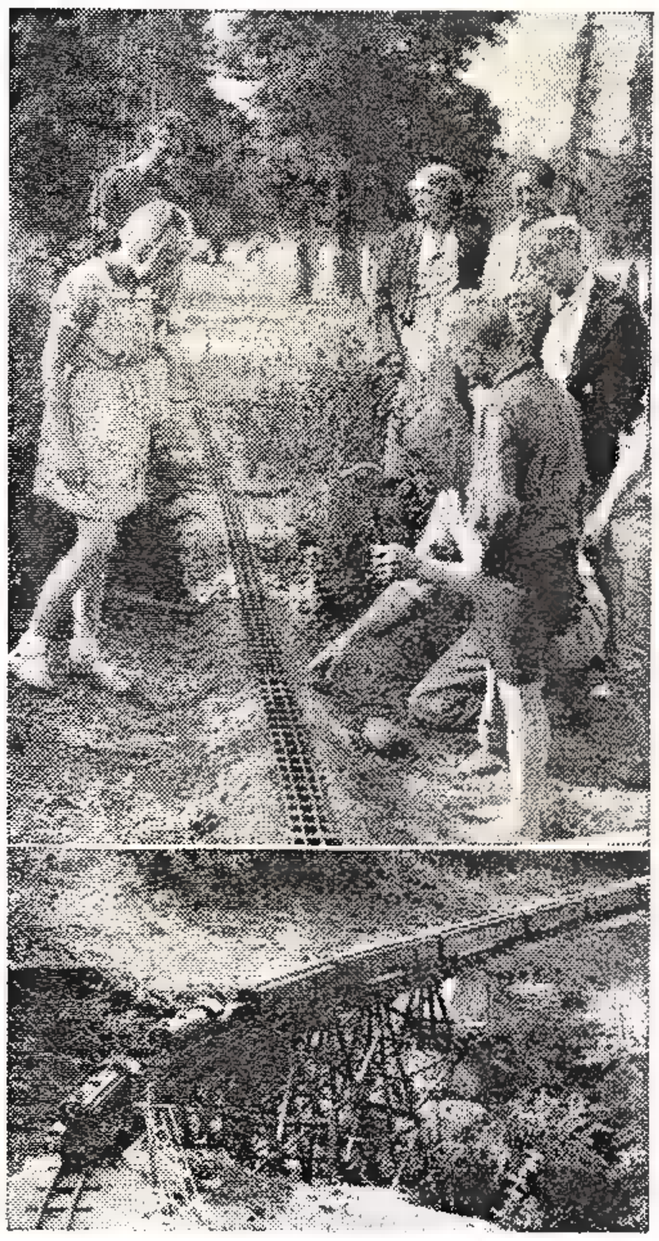
University Professor Builds Complete Model Railroad



Planned by Prof. William Rowan, of the University of Alberta, this miniature outdoor railway is the most complete system of its kind in Canada. The system, which covers most of Prof. Rowan's estate, includes bridges, tunnels, switches and signals. Prof. Rowan is shown above driving the last spike in a section of the right-of-way. Below him is shown a "double-header" passing over a wooden trestle bridge.

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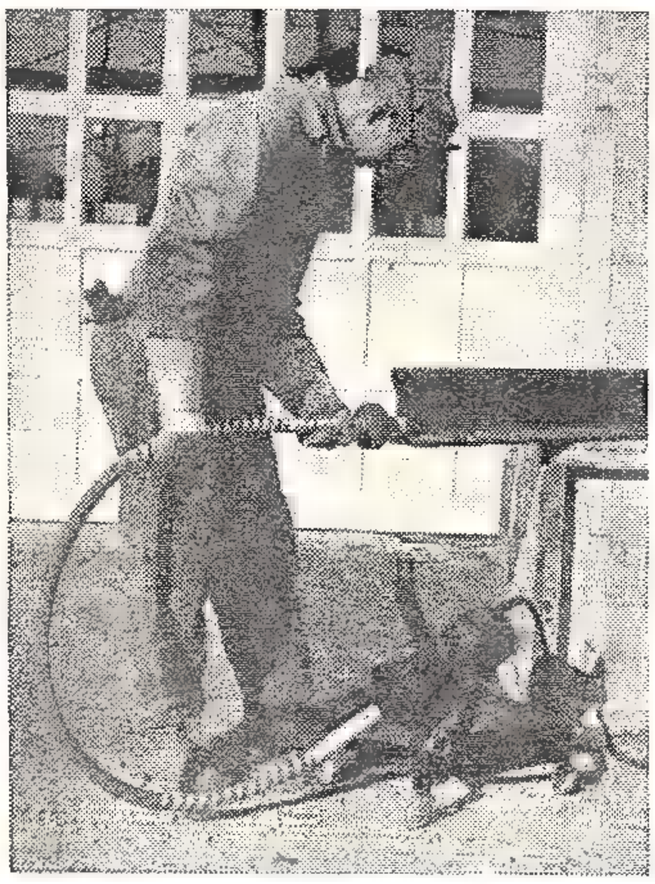
Grinder Rotates At 9,000 R.P.M.



Powered by a 1½-horsepower motor, this flexible shaft grinder operates at 9,000 r.p.m. on either 110 volt or 220 volt A.C. and D.C. current. Used for grinding weld seams, flat surfaces, snagging castings, etc., its 4-inch wheel is said to produce same results as an 8-inch wheel used on slow speed units.

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IMAGINE going into stores, gas stations, etc., empty-handed and coming out with money in your pocket. New, powerful progressive sales stimulator. Merchants going for it. Fast, advance cash commission getter. Automatically repeats. Sales outfit free. Meinhardt, Dept. T-8, 18 E. Kinzie, Chicago.

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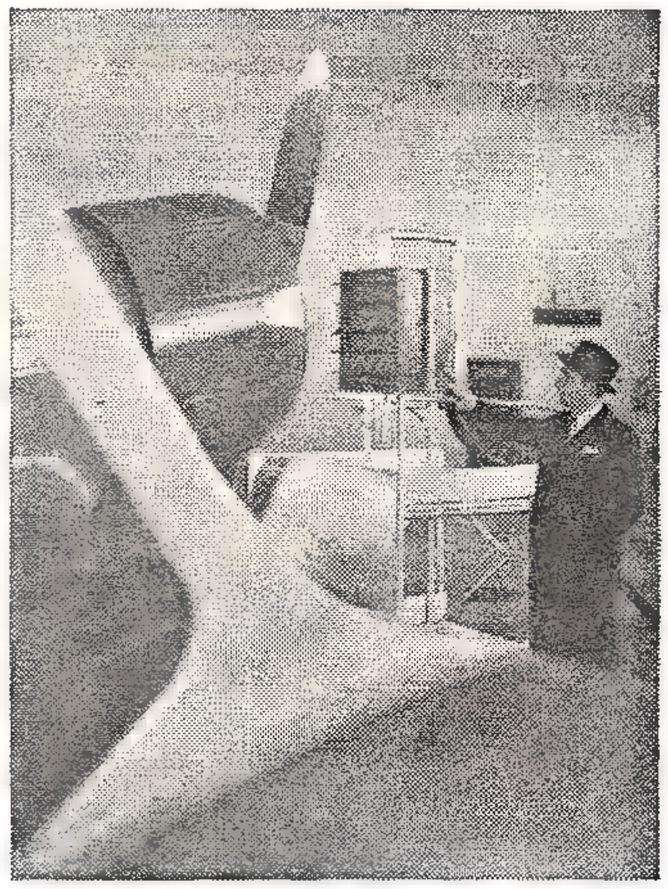
Blower Heater Warms Up Cold Airplane Motors



The problem of heating up cold airplane motors at Indianapolis' Municipal Airport has been simplified by use of a blower heater which is placed in front of the radial motor of the craft. Designed by Nish Dienhart, airport superintendent, the heater is capable of warming up cold motors to such an extent that strenuous propeller "kicking" is eliminated.

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WIND Generators, Propellers. Lowest prices. Woodcraft Propellers, Hillside Station, Wichita, Kans.

Adventures Of Poison Squad

[*Continued from page* 32]

protecting the public from the danger of poisons used in sprays to combat insect pests and diseases that attack fruits and vegetables. Every year thousands of carloads of fruits and vegetables are given painstaking laboratory examination to detect traces of such health-destroying residues. However, many of the states are cooperating and the situation is improving rapidly from year to year, officials say.

But, to complete the story about the White Plains poisoned pastry case. Aided by local health officers, the Federal food sleuths, as mentioned earlier, traced the source of the spoiled food to a single manufacturing bakery in Westchester County and rounded up and destroyed all shipments sent out on the same day as the food poisoning outbreak.

Meantime New York agents of the Food and Drug Administration made a thorough inspection of the bakery that made the pastry and found not a single trace of any unsanitary conditions. To this day the case is somewhat enshrouded in mystery, but it is believed by the Government scientists that the cream-filled pastry became poisonous mainly because it became unduly exposed to warm temperatures without proper refrigeration.

This outbreak and many other somewhat similar ones emphasizes that cream-filled pastries, since they are ideal for the growth of bacteria, should be produced, handled and refrigerated with extraordinary care if they are to be held any length of time before consumption.

A good many months ago New York City members of the Poison Squad tracked down 15 cases of the parasitic disease known as trichinosis, at Williamsville, N. Y. The outbreak, like others occurring in the United States, was traced to the eating of raw, or improperly cooked pork that was infested with the parasite known as Trichinae. Although 8 of the 15 persons affected were confined to hospitals, no deaths were reported. This

[*Continued on page* 151]

ADLETS FOR HOBBYISTS

(See regular classified section for rates and other information.)

STAMPS

SUPER-WONDER Packet offered, containing 60 different stamps from Afghanistan, Transjordania, North Borneo, Manchukuo, Sudan, Macao, Iraq, Charkhari, French and British Colonies, including natives, beasts, ships, etc., all for 5c to approval applicants. Big illustrated lists included. Kent Stamp Company, Box 87-Z (G. P. O.), Brooklyn, N. Y.

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Conditioning Your Sail Boat

[*Continued from page* 141]

and deck paint is lower priced but not satisfactory for this purpose.

Go over fittings and mouldings carefully. Refasten the former after cleaning, using new screws and renew entire sections of rail and quarter round rather than fit in small pieces.

If you change the boat's color scheme do so only after seeing an identical boat so painted or draw yours out on paper and fill in new colors with crayons. Different colors and their placing have a tendency to shorten or lengthen a boat; a chubby craft may be made to look sleek by painting the hull dark with an arrow or contrasting light sheer strake or rubbing rail. A low boat will look larger by painting it white Black is harder to keep clean in salt water, makes for a warmer boat and topside seams have a tendency to open. High cabins and sides should be kept dark. Mahogany, gray or buff colors are recommended. Cut in different colors sharply so as to locate joinings at some point in the construction as deck edge, rail or cockpit coaming. If the waterline is not already scribed or scratched in, tack long timber batten guides along the hull, then scratch in the waterline with a bent and sharpened file tang. It will be there for subsequent paintings and the topside paint can be allowed to run down below the line to be later covered with the bottom paint.

Sails, engine and gear fittings call for treatment all their own. The best plan is to have removed these the previous fall so they can be worked on during the winter in the warmth of the basement or heated garage. Small sails should be laundered clean. If your laundry cannot do the work contact some sailmaker who will tell you where to send them. New York sailmakers will mildewproof sails, old or new, at around twenty cents a pound. No matter the age of your sail go over it carefully before bending it on. Machine sewing patches ashore is easier and better than hand work afloat. Renew grommets wherever loose and mend frayed boltropes. Standing wire rigging is usually painted with galvanized or aluminum paint and splices served with marline wound on over varnished muslin or tire tape. Running rope rigging if only used one season can be trusted another by reversing ends to change working sections. Varnish the mast and boom after sanding and filling cracks and rents with proper filling. Scrape and varnish blocks and oil their sheaves as well as the sail tracks, also paint the anchor and check the condition of its line.

Every manufacturer issues an information book in connection with the running of his particular engines. If you haven't one send in your serial number and secure a copy. Follow its directions for fitting out the engine. Spring is a poor time for major engine repairs as marine mechanics are busy on big jobs now and automobile workers

should not be trusted with these machines because they do not appreciate the difficulties under which they run. Minor adjustments are usually all that are required. Perhaps new packing if oil has been oozing out, strainers cleaned, points and plugs renewing for best possible running and the battery recharged or replaced.

Canoes call for larger boat treatment in smaller doses. Modern marine glues, especially the hard glue treatment outlined, work wonders with torn and worn canvas. Manufacturers issue helpful booklets in connection with such repairs and their products have removed the old bugaboo of canvas covered boats.

Hardboiled boat owners often try to impress the newcomer with all the work necessary at fitting out time, but a comparatively new boat decently used and kept up during the summer and properly laid up for the winter invariably requires more than a careful preliminary cleaning, a thorough sanding and an interesting final light painting with good paint. For some years to come harder jobs, barring accidents, will result only from carelessness. Careful owners avoid major repairs and heavy expense by commonsense use.

Adventures Of Poison Squad

[*Continued from page* 149]

fact is attributed to the prompt action of the Federal health sleuths, aided by Dr. Myron Metz, local health officer, who obtained a list of the buyers of the infected pork and advised each person to call a physician in case he felt sick.

A case of food poisoning in North Dakota, in which 12 persons died from eating home-canned peas, has prompted the United States Department of Agriculture to call attention again to a method of canning non-acid vegetables in the home to guard against the deadly botulinus poison.

In the canning of non-acid vegetables—peas, asparagus, beans, corn, beets, and spinach—the only safe course is to destroy all bacteria that may be present by canning under steam pressure, according to the Bureau of Home Economics. In the case of acid vegetables and fruits, such as tomatoes, apples, peaches, and gooseberries, the bacteria are killed at boiling temperature (212° F.) but with non-acid vegetables there is no assurance that the botulinus organisms will be killed by processing in boiling water unless the material is heated for six hours or longer. Obviously, a 6-hour treatment of peas or similar vegetables would result in a very unattractive product. A much shorter heating time is required at a temperature of 240° or 250° F., such as may be obtained in a pressure cooker.

Popularity of chemistry is suggested by a survey showing that in 80 women's colleges, 11 per cent of students took the first general course in this science.

★

INVENTORS

SEE

Pages 6 and 7

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tor auto parts. Connect to a battery, no tanks used. Almost as simple as painting. Your opportunity to make good income plating auto parts, reflectors, mirrors, etc.
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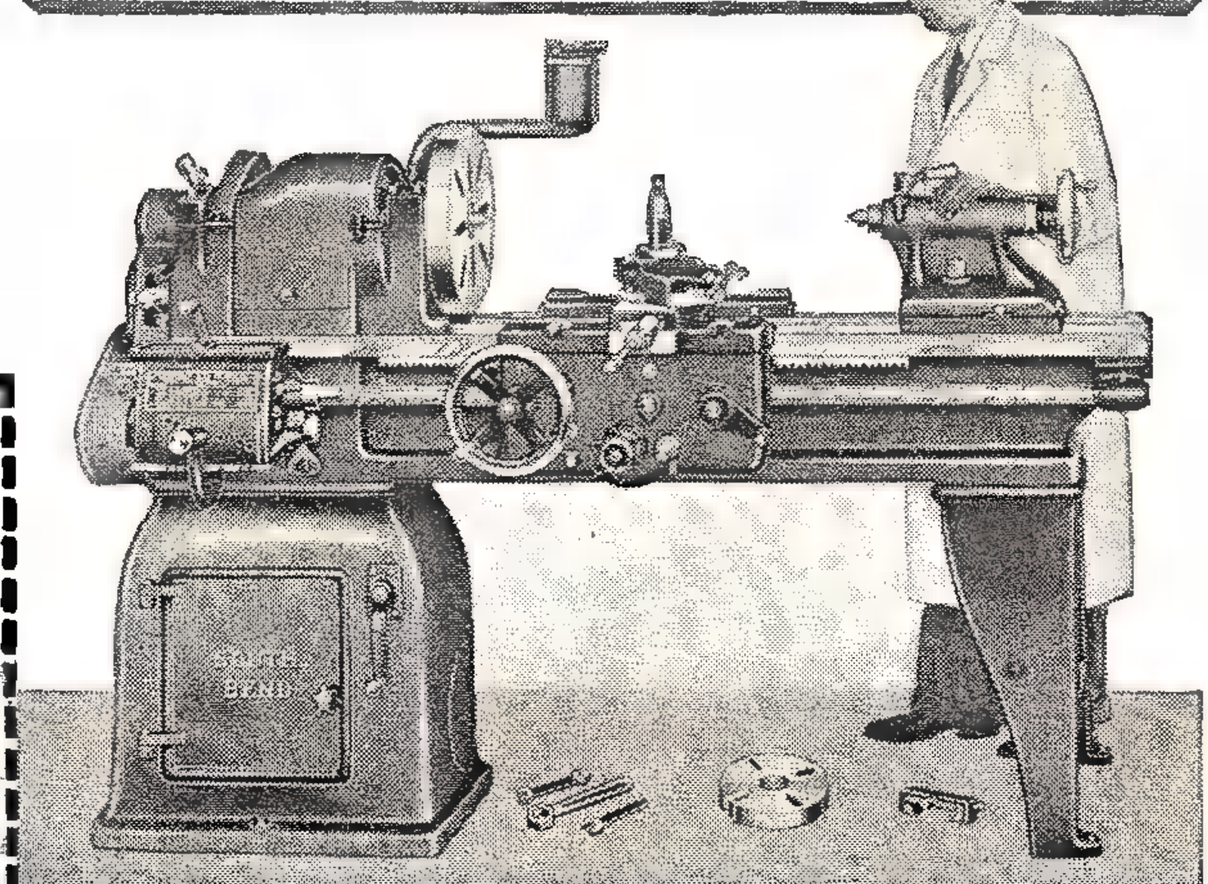

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SOUTH BEND *Precision* LATHES

Dogs — Diamond Guardians

[*Continued from page* 56]

are more than sixty Alsatians and fourteen bull-mastiffs—a "staff" from which the fifty dogs that keep watch every night are drawn.

"All the most important places on the mines have their dog sentries at night—the pulsator house, where the diamonds are finally recovered, and the offices in Kimberley where diamonds are kept in safes," Mr. Marsberg told me. "At each spot there is a dog chained to a picket line about a hundred yards in length. If this dog hears a suspicious sound, it barks and up comes a "fighting dog," that has been roaming the area free, to investigate.

"Cattle are responsible for many false alarms. But at long intervals the dogs find a man wearing knee and elbow pads, crawling over the ground in search of diamonds. Then the "fighting dog" puts its training into practice and tackles the raider without biting. If the man attempts to escape, the dog will hang on to his arm, but it will never fly at his throat. Otherwise the dog will escort the man and shepherd him towards the human guard.

"A raider armed with a revolver is forced by the dogs to drop his weapon. The dog then carries the revolver in its mouth until the guard takes charge of the trespasser. So cleverly do the dogs carry out their duties that I have never known a dog to be injured in a tussle."

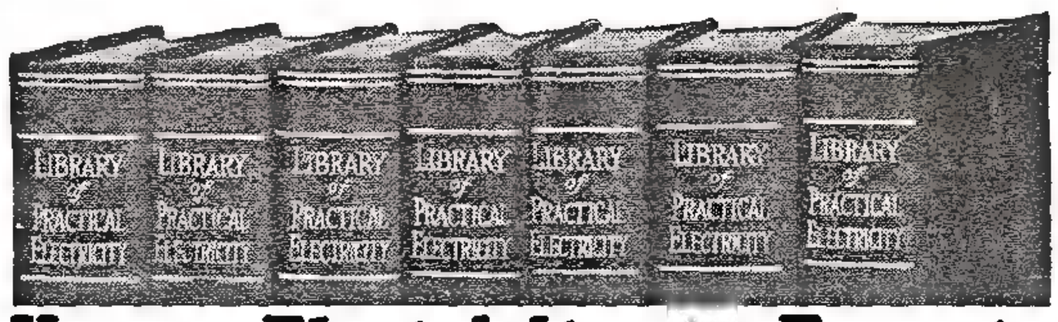
Mr. Marsberg was once bitten in the nose while stopping a dog fight, but he declares he has never known a treacherous Alsatian. Training starts in the "kindergarten," where the puppies are strung out on a picket line and taught to sit and lie down at the word of command, and later to heel.

After a month or two comes a course of discipline, when the dogs go over jumps and hoops. Finally there are exercises in which a man wearing a padded leather suit with long sleeves takes the part of a raider, and the dogs are taught to hang tenaciously on to the man until the trainer arrives on the scene.

I saw a dramatic rehearsal with a famous dog named Bongo in the leading part. Bongo is ten years old, one of the first batch of Alsatians trained, and still doing useful work. A man went into hiding in the long grass, and Bongo was sent sniffing out in search of him. Discovered within a minute, the man lashed out furiously. At once Bongo hackled up and gripped the long leather sleeve. It was clear that a raider, seized by those teeth, would soon give up the struggle.

In the next test Mr. Marsberg stuck a match in the ground and dispatched Bongo to reveal the strange scent. The match was speedily delivered to the trainer.

These dogs can jump over burning fences, climb walls twelve feet high, walk the plank, and obey whistles and signals. The full training period is eighteen months to two years.



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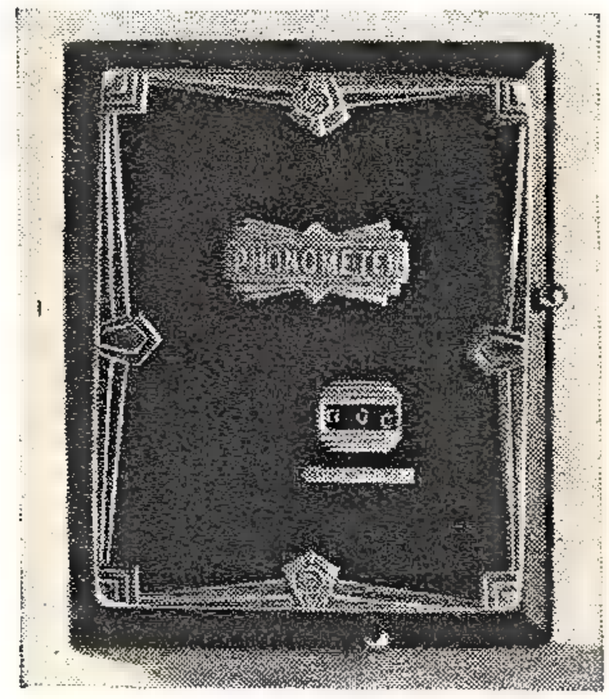

New device keeps visible record of all outgoing calls from any household or office telephone.

A sheepskin mitten for car washing use. Special treatment of mitten eliminates the need for chamois when car is cleaned.

A child's vehicle propelled by pushing and pulling a handle in front of the seat. Designed for children between the ages of three to ten years, its frame is capable of supporting 200 pounds.

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A pneumatic valve grinder giving 600 to 6,000 strokes a minute, and is instantly adjustable.

A slow speed, high torque hand drill.

A knife especially designed for stripping insulation from wires.

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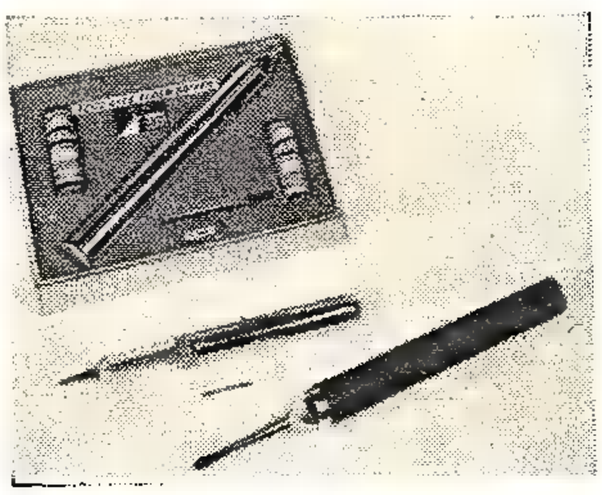

A screwdriver incorporating a flashlight attachment shines light on the work when needed.

A new series of transmitting condensers for high and ultra-high frequency units. Plate spacing varies between .031 and .171 inches, depending upon the voltage breakdown required.

Editor's Note—Addresses of manufacturers of these and other new products in this issue can be obtained by sending a stamped, self-addressed envelope to Modern Mechanix Publishing Co., Information Bureau, Fawcett Building, Greenwich, Connecticut. Manufacturers are invited to submit material for publication on this page.

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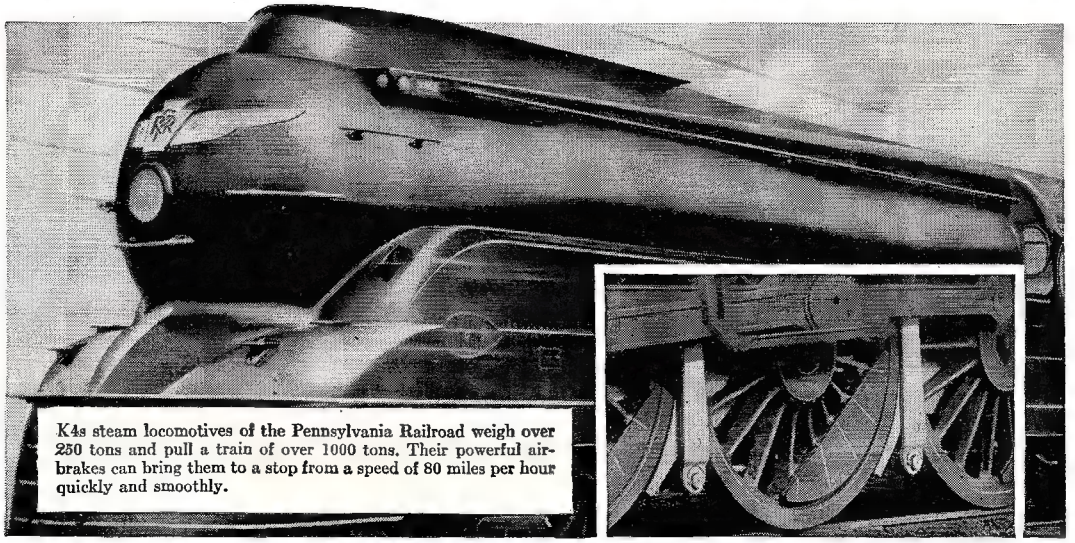


K4s steam locomotives of the Pennsylvania Railroad weigh over 250 tons and pull a train of over 1000 tons. Their powerful air-brakes can bring them to a stop from a speed of 80 miles per hour quickly and smoothly.

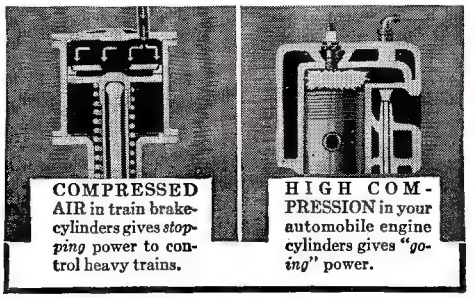
BRAKE SHOES are jammed against racing drivers by compressed air power for smooth, safe stops.

Powerful air-brake of locomotive illustrates HIGH COMPRESSION principle of modern auto engine

THE higher the air-pressure in the locomotive brake cylinders, the more stopping power Casey Jones gets. The higher the compression in the cylinders of your automobile, the more driving power you get.

That's why automobile manufacturers are using high compression engines in even the lowest priced cars. These cars squeeze more power, more mileage, more get-up-and-go from every drop of gasoline.

To get these advantages, set the spark for maximum performance *and use a fuel made for high compression!* Stop at pumps marked "Ethyl." There you will get more anti-knock fluid (containing lead tetraethyl) than you get in the best regular-grade gasoline. By preventing harmful knock and overheating, you make sure of 100% performance from your high compression engine and save on gas and oil.



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A frank man to man talk about PATENTS-INVENTIONS -SELLING INVENTIONS

THE world of invention moves on. About a hundred years ago people were saying, "There's nothing left to invent"—today we know that is one of the funniest things ever said. Just think what has happened in the last hundred years! Autos, radios, airplanes, and thousands of useful, practical devices for home, shop and office have been invented and put on the market. Inventors are constantly making the world a better place to live in. Did you see a notice in the paper that an obscure worker, Hans Wach, has invented a simple device to utilize exhaust steam on steam boats. *Already, the report states, the steam ship lines have saved more than $15,000 in fuel bills with his invention.* Almost in the same breath the Dept. of Commerce announces that it will soon test out a new non-crashable aeroplane, which the average man can learn to fly in a day, which will travel at 110 miles an hour and sell at the price of a cheap automobile. An unknown Seattle man has invented a robot to go 5,000 feet under the sea and recover millions and millions of dollars worth of gold lying at the bottom of the ocean since the days of the early Spaniards.

Remember this: For every outstanding big invention there are thousands of small, simple things for use in the home, the office, the factory, on the farm, on every sort of travel conveyance. Little articles like you find on the counters of a 10-cent store, hardware store, drug store, toy and novelty shop.

Many Little Ideas Have Big Commercial Possibilities

A person finds something he's using doesn't work right, or it's clumsy, or costs too much. He gets a happy thought. He improves the old Article. That's contribution to human progress. That's the way that many, many men have reached the goal of financial comfort, independence and even wealth. Most of the things millions of us use didn't come from the brains of engineers and physicists. They came from the mind and maybe the crude home work bench of Mr. Average Man, busily engaged in earning his bread and butter at whatever chance or circumstance has given him to do. The "little" man's opportunity as an inventor was never greater than it is today.

Who Are Inventors?

You'd be amazed at the men we contact in the course of a busy year. Most of them do not consider themselves inventors at all. During their work or leisure they get an idea. They work it out on paper. They get in touch with us about Protection. Did you know that a dentist invented the stock ticker, a school teacher the telephone, a farmer the typewriter, an artist the telegraph? Did you know that the crinkly hair pin—sold by millions now—came about because a husband saw his wife twisting the old-fashioned straight hair pin to make it stay in place? **Poor men who have no thought of invention now will be financially well-fixed in a few years because of a happy thought that the world could use to advantage.**

Can You Answer These Questions?

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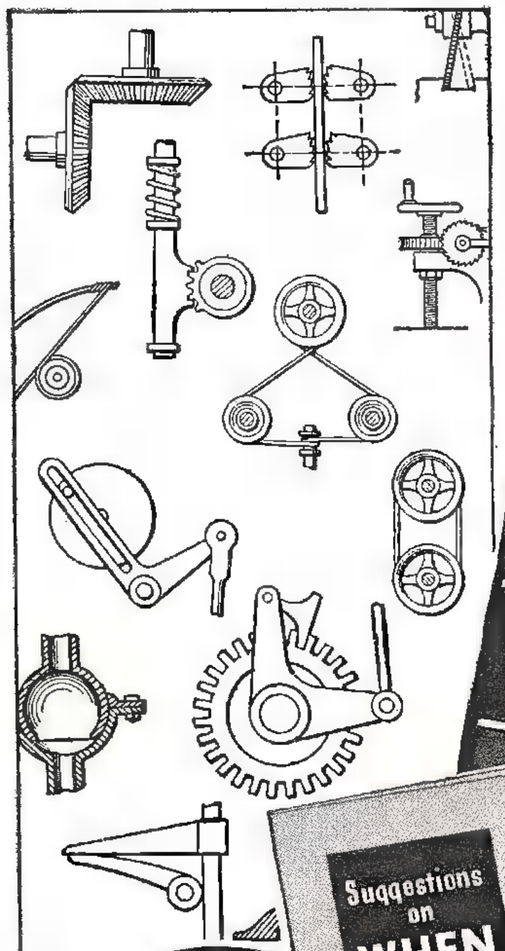

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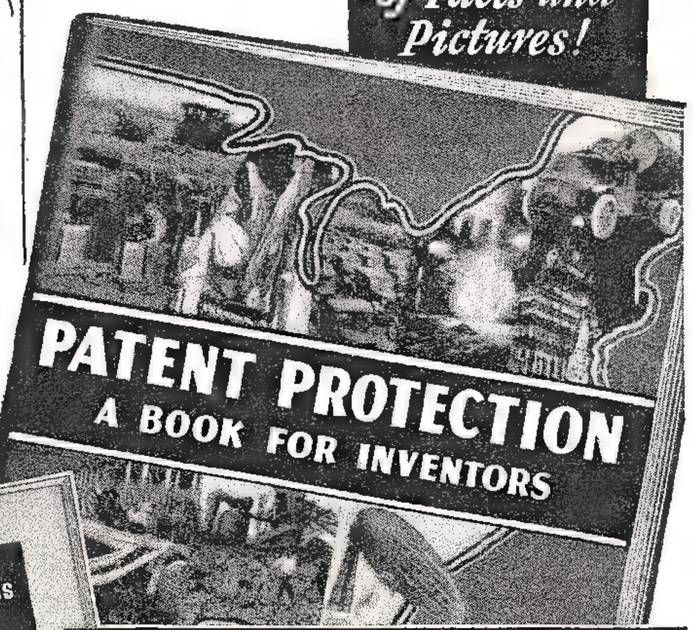

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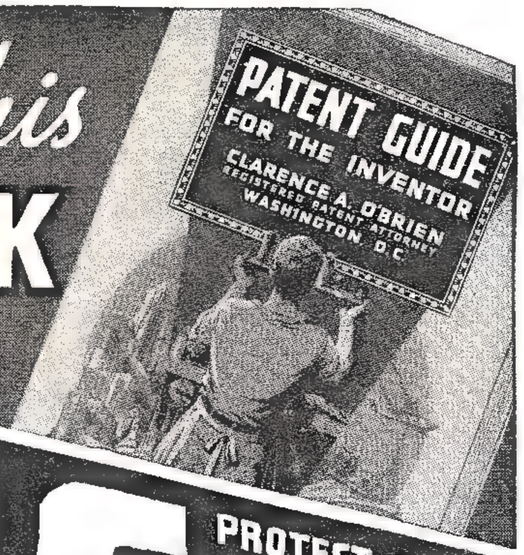

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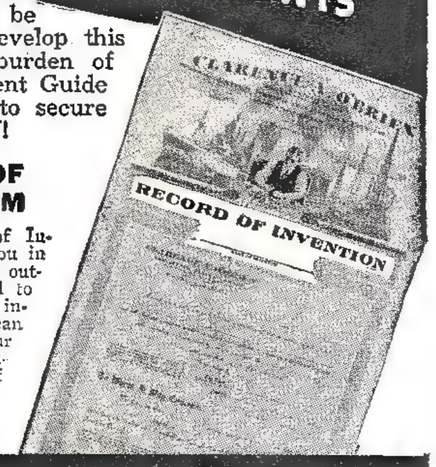

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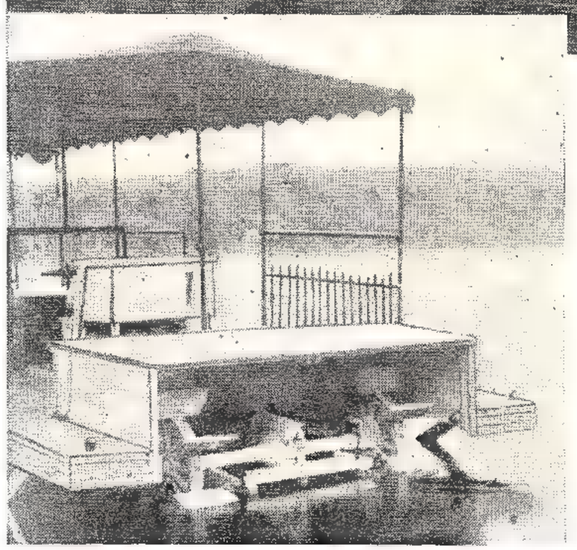
Random Chips from the Editor's Workbench



This 25-passenger sightseeing boat (top) was constructed by H. G. Meigs, of Milwaukee, Wis. Lower photo shows how paddle wheels are attached to auto rear-end to propel the craft.

WE WISH to remind all readers that letters and photos relating to projects completed in home workshops are *always* eligible for entry in the monthly Editor's Workbench contest. There is no time limit, contributions receiving careful consideration as soon as received in the MM office. A monthly selection is made from the available photos, a prize of $5 being awarded to the reader who, in the opinion of the editors, sends in the most interesting photo and letter. Prizes of $3 each are awarded for all other photos published in the Workbench each month. Send in a photo and letter describing projects you have completed.

***

A letter describing an unusual project was received from H. G. Meigs, of Milwaukee, Wis., who was awarded this month's first prize of $5. His letter reads:

Dear Editor:

I thought you might be interested in a sightseeing boat which we built, so I am sending you photos of it. The boat has a speed of 12 m. p. h. and is very popular with visitors to the lake resort where the boat is kept. It has a draft of only five inches.

The motive power consists of an automobile engine and transmission. The rear end of an auto is mounted on a framework so that wooden blades attached to the rims of the wheels can propel the craft. An automobile steering wheel is mounted by the driver's seat, having a large spool attached to the bottom of the shaft in the hold. A flexible cable runs from this to the rudder.

H. G. Meigs.

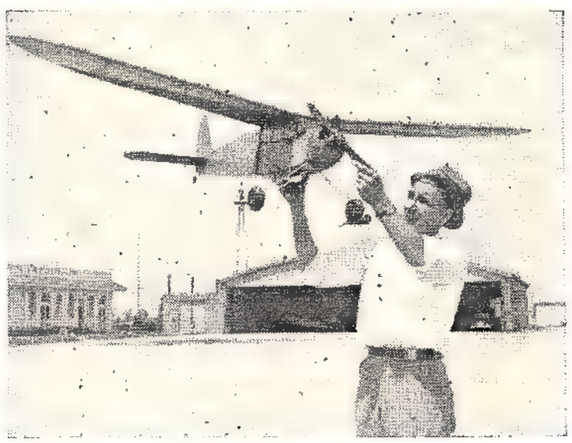
Reader Meigs is to be complimented for completing such a novel and practical project.

***

An award of $3 was sent to Wendell Lalley, of Monroe, La., for his letter and photo describing an attractive "gas" model airplane. He says:

Dear Editor:

I am sending you a photo of my "gas" model airplane. Although I have built many rubber-powered models, this is the first "gas" model I ever tackled. It has a span of 7 feet, weighs 4¾ pounds, and is powered with a motor of one-fifth horsepower.



Powered by a miniature gasoline engine of 1/5 horsepower, this model plane has a 7-foot wingspan. Wendell Lalley, who built the model, prepares to test its gliding qualities.

I enjoyed the "gas" model article that appeared some time ago. Why not give us some more plans for "gas" models? I would also like to correspond with readers who are interested in such models.

Wendell Lalley.

Lalley's model looks like a well designed and well constructed one. We hope he will build the Bellanca gas model described (final installment) in this issue.

***

This is the season for midget racers and a letter and photo received from James Webb, of Attwood, Ill., telling of his speedy little auto was awarded a prize of $3. He says:

Dear Editor:

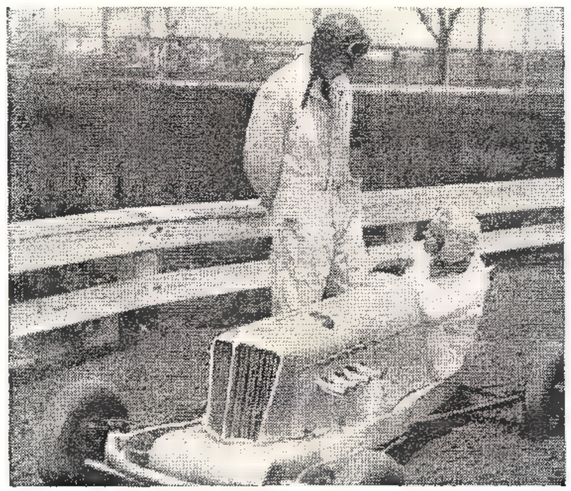
Enclosed is a photo of a midget racer that a pal and myself built. We want to tell you how pleased we are with your magazine for we get most of our plans from it. We are now planning to build the sailing cruiser "Buddy". Good luck to MM.

James Webb.

While Webb neglected to supply details concerning the size, power, etc., of his tiny racer, we awarded him a prize on the basis of its appearance alone.

***

Novel in appearance and utility is the project described in a letter from W. Posniak, of Tampico, Mexico, which won an award of $3. He writes:



Midget autos still continue to intrigue MM workshop fans. This metal-clad racer built by James Webb, of Attwood, Ill., was awarded a prize on basis of its appearance alone.

Music played by W. Posniak, of Tampico, Mexico, is picked up by the microphone lamp he built and emanates from small radio set nearby, serving to entertain friends in novel manner.

Dear Editor:

I am sending you a photo of the microphone lamp that I constructed. The device is 12 inches high without the light globe, the microphone ring having a 6-inch diameter with a center disc 3⅞ inches in diameter.

The photo shows me broadcasting over the microphone lamp, the music being heard from a small radio set located nearby.

W. Posniak.

A microphone lamp provides much entertainment and constitutes a project that has appeal to all radio fans.

***

From Oteen, North Carolina, came a letter written by C. E. Self which was awarded a $3 prize. It reads:

Dear Editor:

I am enclosing a picture of a miniature railroad caboose that I built from discarded match sticks. I hope you will consider the project in the Workbench contest.

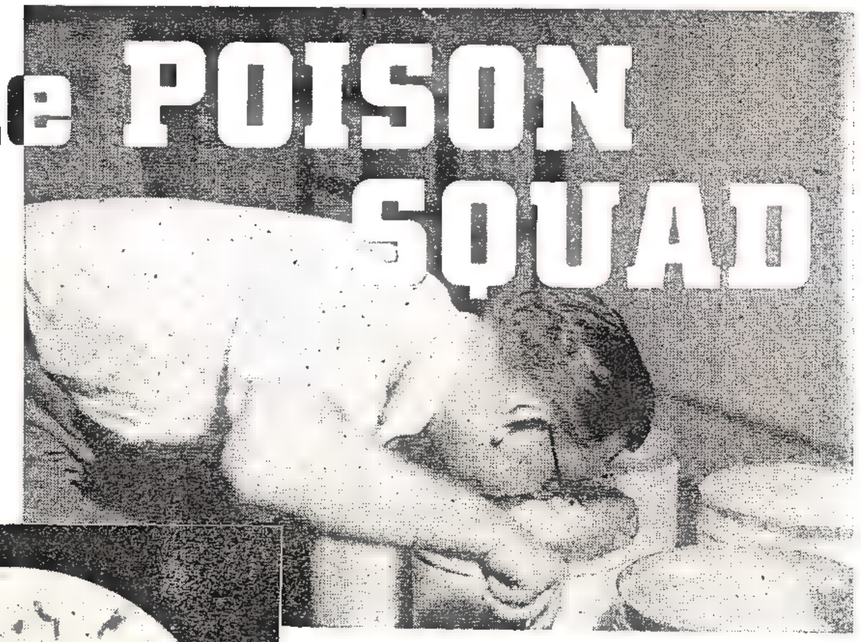
The walls of the caboose are constructed of burnt match sticks. The roof is covered with the inside of the boxes that the matches were packed in. The wheels, steps, oil boxes, and draw heads are made of wood, whittled to proper shape.

Four bunks are features of the caboose interior, while four seats are located in the cupola, all of which are upholstered in leather. The windows are made from old X-ray plates. The caboose is 16 inches long and

[*Continued on page* 16]

ADVENTURES of the POISON SQUAD

The U. S. Food and Drug Administration constantly labors to insure the quality of food products. Through the efforts of its field inspectors and expert laboratory technicians, the Federal bureau tracks down poisoned foods that constitute a threat to the nation's health. Left — A Federal chemist using special apparatus to determine the condition of canned goods.



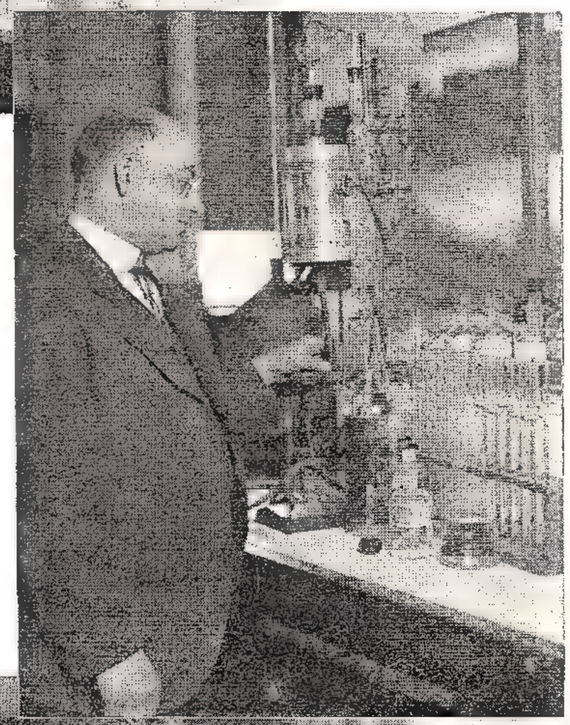
"His nose knows." This Federal agent can tell in a few seconds whether or not a shipment of powdered eggs is in satisfactory condition by merely smelling the product. However, to make doubly certain he will take along samples to be scientifically tested in Food and Drug Administration laboratories. All to safeguard your family's health.

by James Nevin Miller

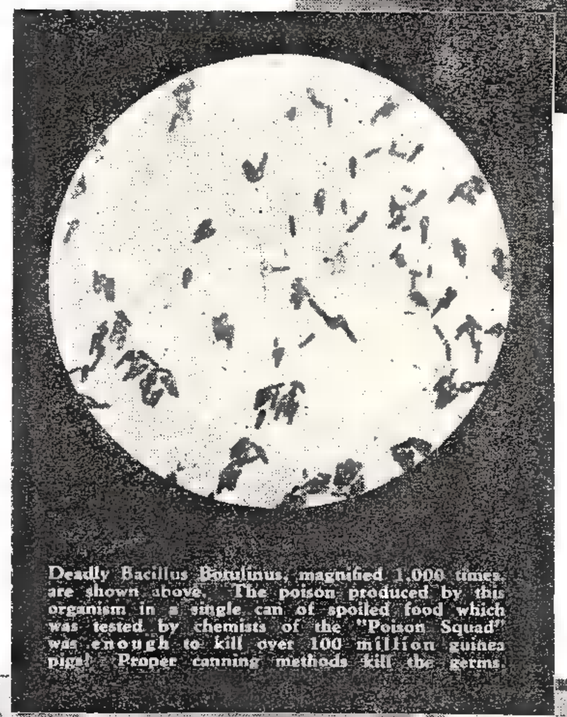
IN THE city of White Plains, N. Y., not so long ago, more than 700 people suddenly were stricken with a mysterious ailment. City authorities thought the case was food poisoning. But just what kind, puzzled them. True enough, it was learned that all the victims had eaten chocolate eclairs, cream puffs or Boston cream pies. However, none of the custard-filled pastries appeared to be "spoiled" although it was suspected that contaminated custard filling might have been the source of the poisoning.

Therefore, the city officials turned over samples of the pastry to the New York office of the U. S. Food and Drug Administration. These Government experts in turn sent the pastry to the Washington laboratories of the Administration.

Very quickly, the Federal investigators, aided by local authorities cleared up the situation by tracing the source of the spoiled food to one manufacturing bakery in Westchester County, seizing and destroying all shipments sent out on the same day as the food poisoning outbreak, and identifying the deadly bacteria that caused the large-scale illness.



Is your ginger ale fit to drink? J. B. Wilson, a Federal expert chemist (center), can tell you. He is shown conducting a test to determine the purity of a soft drink. Right—Spoiled sea foods are sometimes offered for sale, but not if B. A. Linden, bureau bacteriologist, can help it. Samples of sea food are collected regularly and submitted to laboratory examination.

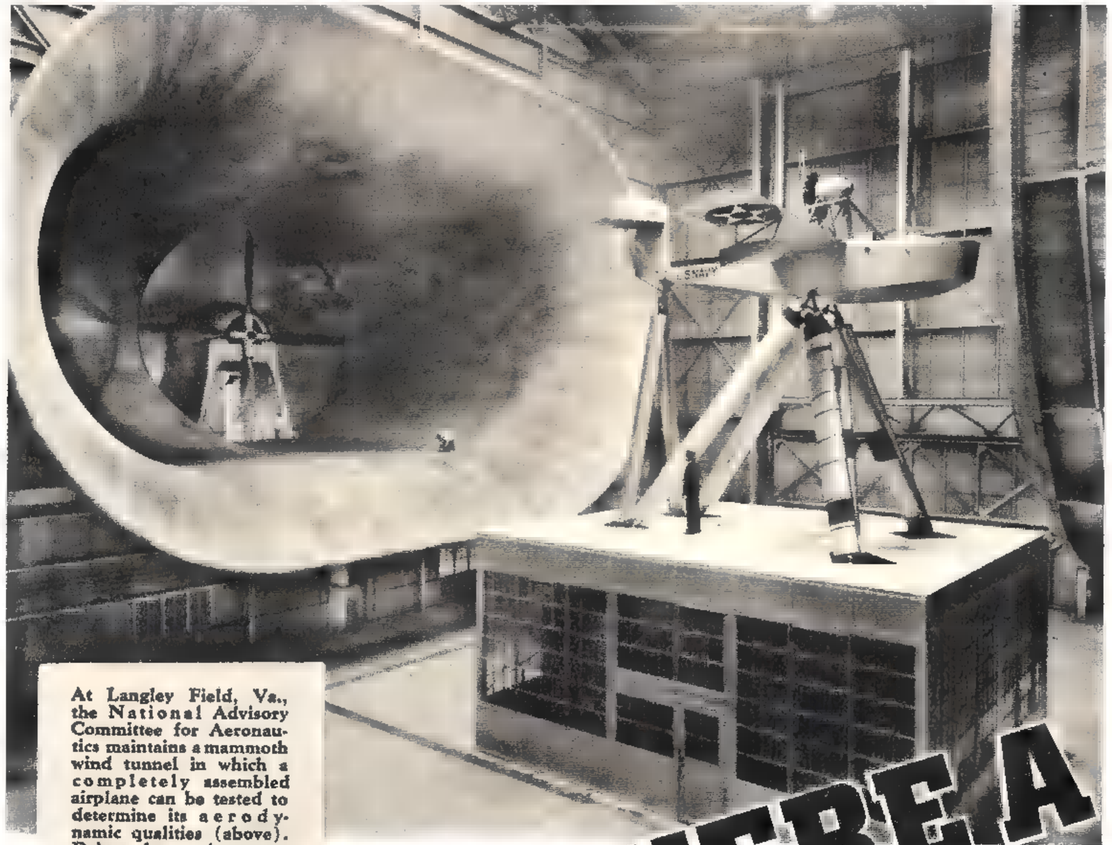


Deadly Bacillus Botulinus, magnified 1,000 times, are shown above. The poison produced by this organism in a single can of spoiled food which was tested by chemists of the "Poison Squad" was enough to kill over 100 million guinea pigs! Proper canning methods kill the germs.

Thrills are commonplace to these health sleuths, who are known unofficially as Uncle Sam's "Poison Squad." Their job is to guard the safety of your pantry by tracking down, armed with ingenious laboratory and field methods, outstanding cases where moldy fruits and vegetables, contaminated sea foods, spoiled canned goods, and doubtful-looking imported edibles offer a serious menace to the health of the nation.

Just a few of the Poison Squad's recent achievements, besides the settlement of the poisoned pastry case, include: the rounding up, during a three months period, of nearly a quarter million shipping cases of canned salmon, an appreciable percentage of which was spoiled; the investigation of a food poisoning outbreak in Philadelphia somewhat similar to the one at White Plains; and the discovery of the cause of a strange "epidemic" of the

"Looks mighty suspicious," says this laboratory expert as he proceeds with tests to determine whether a can of corn is safe for your palate or whether it is teeming with health-destroying bacteria. Poisoning from canned foods has decreased greatly since adoption of improved canning methods, but the Federal chemists are vigilant.



At Langley Field, Va., the National Advisory Committee for Aeronautics maintains a mammoth wind tunnel in which a completely assembled airplane can be tested to determine its aerodynamic qualities (above). Driven by engines producing 4,000 horsepower each, two 35½-foot propellers blast the air past the airplane's controls at velocities up to 118 m.p.h. The tunnel is 434½ feet long, 222 feet wide, 97 feet high.

IS THERE A SPEED LIMIT?

by Don Glassman

Major James ("Jimmie") Doolittle, famous American speed and stunt pilot, conducted risky flight tests that helped determine the acceleration speeds of various aerial maneuvers.

NOBODY knows how long the present speed marks can endure. In a world of sudden change and far-reaching discoveries, the mortality rate of speed records is high.

All the racing heroes want to hang up unbeatable records. Gradually, but surely, they have been approaching the speed beyond which they cannot go, for there is a law which no speeder can break. Nature laid it down without consulting us.

A 575-mile per hour speed limit for modern airplanes was recently determined at the Langley Field, Va., "super-speed" wind tunnel by the engineers of the National Advisory Committee for Aeronautics. With present designs, you may be sure that no man will surpass that figure.

Beyond the 575-mile critical speed, forward motion is checked by a "shock wave" of turbulent air that travels from front to rear of an airplane wing and wastes the energy. Result:—the wings lose their lifting power.

In engineering language this "shock wave" of air is called the "compressibility burble." The violence and turbulence of the burble causes a severe drag on the wings. The power that was intended to support the wings is spent as useless heat.

In the Macchi-Castoldi-72 seaplane shown above, Lieut. Francesco Agello, Italian ace, set a world's speed record of 440.67 m.p.h. in 1934. The plane's 3,000 h.p. Fiat engine had tandem propellers revolving in opposite directions to eliminate torque.

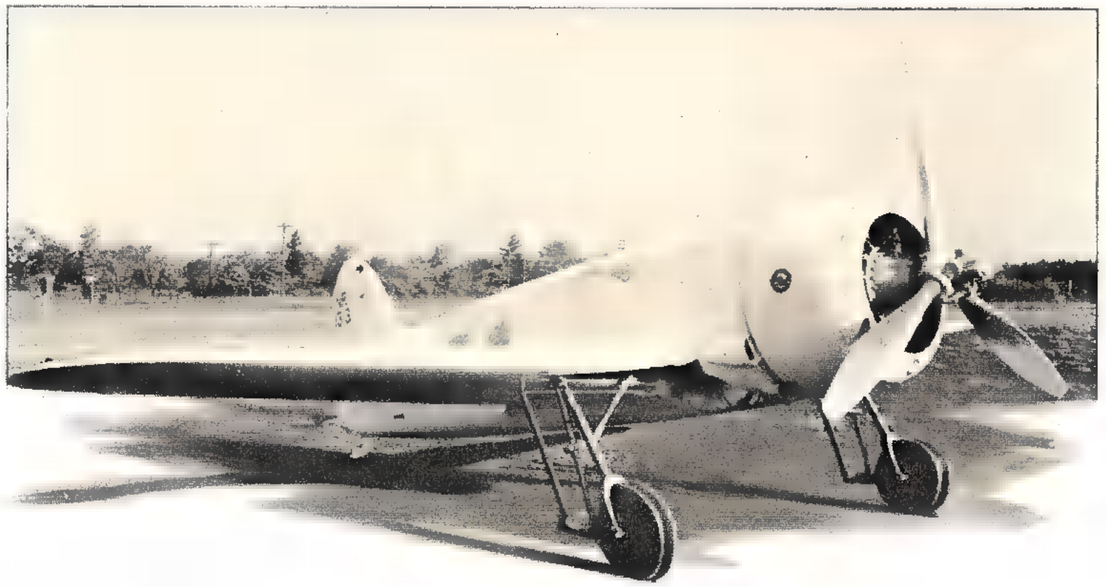
A too-sudden change in acceleration while testing a new Navy plane is believed to have caused Jimmy Collins, well known test pilot, to become unconscious, resulting in the crash that caused his death.

The burble is not a factor in airplane speed until the free stream of air approaches the velocity of sound—750 miles per hour. With each increase in speed, the burble travels farther from front to rear of the wing, and dissipates still more energy as heat. If we could travel beyond 750 miles per hour sound waves could never catch up with our flight. That would be "supersonic" speed.

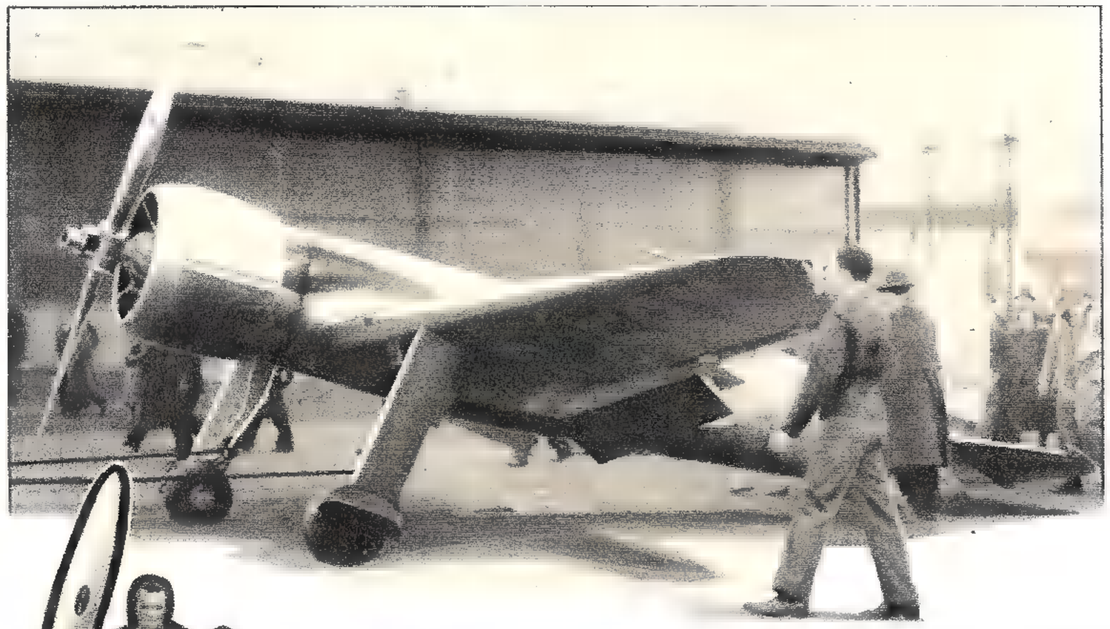
These facts hold good for the types of airplane wings in use today, and it is highly probable that a corresponding burble could be found for every common form of transport if desired.

With suitable wind tunnels, one could determine the critical speeds of ship, train, auto, and dirigible forms, but at the present stage of development there is no point in making such experiments, since all these transports are still very far below their respective critical speeds. With the airplane, however, the speed record now held by Italy stands at 440.67 miles per hour, only 135 miles per hour below the critical speed.

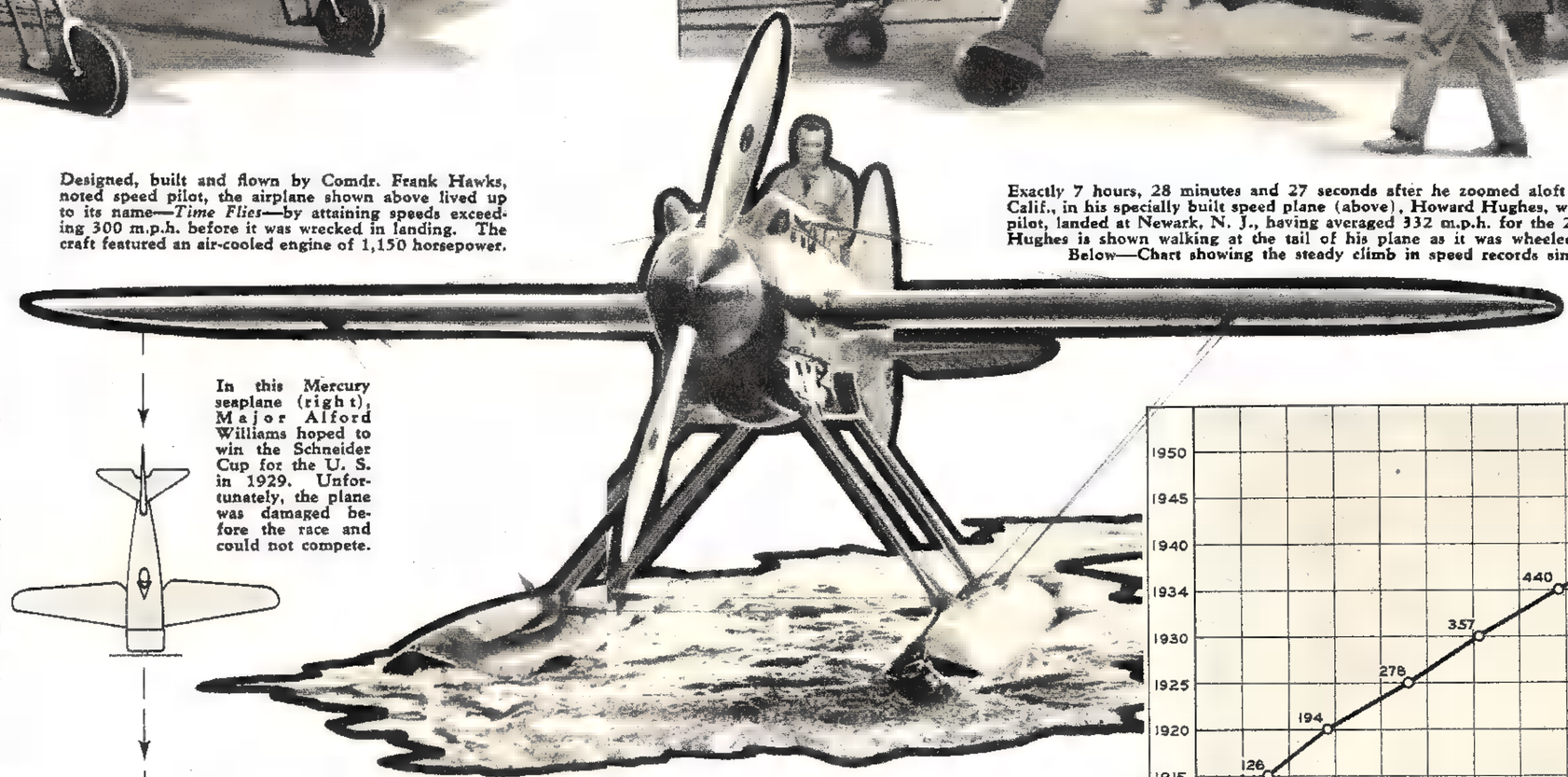
The Speed School at Densenzano, Italy, has specialized in the training of crack speed pilots for years. Premier Mussolini told these men to work for a velocity of 600 miles per hour. In the light of present knowledge about



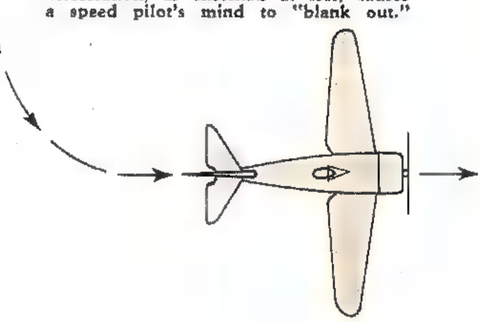
Designed, built and flown by Comdr. Frank Hawks, noted speed pilot, the airplane shown above lived up to its name—*Time Flies*—by attaining speeds exceeding 300 m.p.h. before it was wrecked in landing. The craft featured an air-cooled engine of 1,150 horsepower.



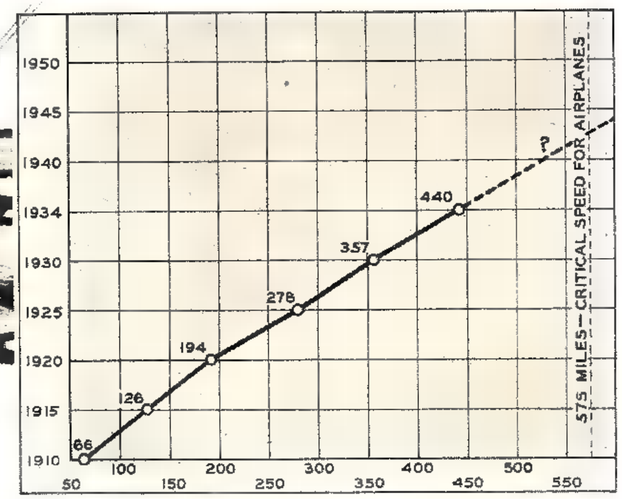
Exactly 7 hours, 28 minutes and 27 seconds after he zoomed aloft at Los Angeles, Calif., in his specially built speed plane (above), Howard Hughes, wealthy sportsman pilot, landed at Newark, N. J., having averaged 332 m.p.h. for the 2,490-mile flight. Hughes is shown walking at the tail of his plane as it was wheeled into a hangar. Below—Chart showing the steady climb in speed records since 1910.



In this Mercury seaplane (right), Major Alford Williams hoped to win the Schneider Cup for the U. S. in 1929. Unfortunately, the plane was damaged before the race and could not compete.



Speeding along a straight path seems to have no ill effect on the human body, but a sudden change in direction or acceleration, as sketched at left, causes a speed pilot's mind to "blank out."



the burble, the Italians seek to invent a new type of air foil with a higher critical speed. And that is not impossible.

What about man's own engine? Do our bodies have a critical speed? As I sit on my chair, I am being whirled through space at the dizzy velocity of 1,140 miles per minute—the earth's speed. It is said that 36 distinct motions are involved. Nobody feels any ill effects from this pace, although it is far beyond the critical speed of the airplane.

There is quite some difference, however, between traveling through space with Mother Earth and traveling at 400 miles per hour in an airplane. In our joy ride on the earth we do not turn sharp corners or experience sudden accelerations. Traveling along a straight line at any speed seems to make little difference to our bodies. But the experience of speed pilots tends to show that taking curves at high speeds is something positively annoying, and probably injurious, if carried to extremes.

The "blank out" experienced by speed and test pilots is a sensation caused by the blood rushing away from the head, creating a shortage of oxygen. In highspeed aerobatics, the centrifugal force makes one's body feel much heavier than it actually is, and one finds it difficult to raise an arm or to stand up. To counteract this sudden drain of blood from the head, test pilots wrap their bodies in bandages, or tight belts.

Sudden acceleration and quick change in direction are the chief difficulties man has to contend with when attempting to set new speed records. To visualize what happens in a case of extreme acceleration: if an airplane could take off with the acceleration of an automobile piston, the pilot's effective weight would become 20 tons and his body would flatten like a pancake. A burst of speed can break a man's neck unless he has a solid head rest.

A free body falling in space falls 16 feet in the first second of its descent and gathers speed at a rate of 32 feet per second. This rate of fall is called one-gravity. If the acceleration is increased to about three times the normal acceleration of gravity, you approximate the takeoff speed of an airplane launched from a catapult. An acceleration of three-gravity is 100 times the normal acceleration of a steam locomotive. An automobile starts off only one-sixth as fast as the catapulted airplane.

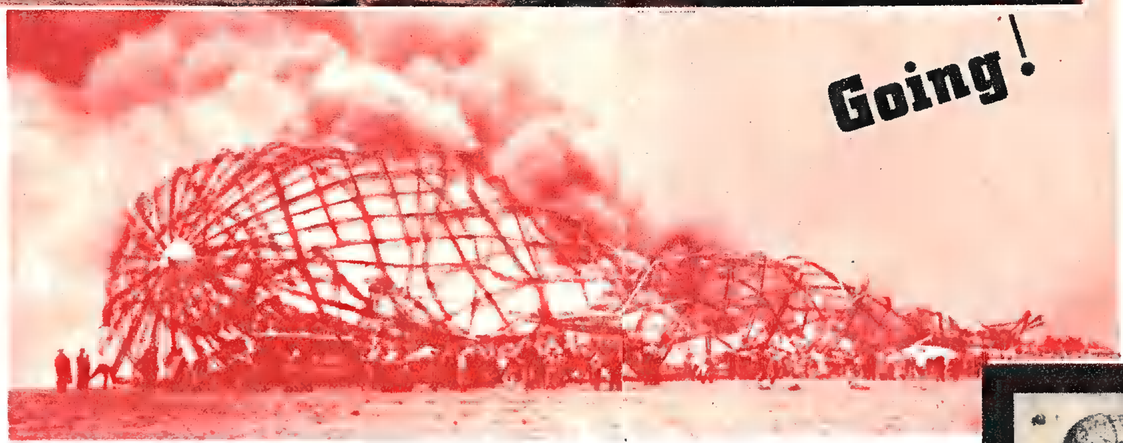
Some interesting discoveries in the field of

[*Continued on page* 122]

36 Killed on the "Hindenburg" But Records Prove That ZEPPELINS ARE SAFE!

by Bob Gordon

The nose already a mass of burning wreckage, the flaming tail of the giant German Zeppelin *Hindenburg* settles to earth after exploding while landing at Lakehurst, N. J. Naval air base on May 6th, 1937.



TO MOST of us Earth-bound mortals, there is something singularly terrifying about death from the sky. The only terror equal to it is death from fire. When the two horrors are combined in one spectacular disaster such as overtook the airship *Hindenburg*, we of panicky imaginations are prone to ignore facts, prone to throw up our hands and cry, "That is enough!"

Yet the men who must face this fate again if airship progress is to continue are far from ready to cry enough. Every uninjured survivor of the *Hindenburg* crew hurried back to Germany, that he might get a berth in the next great Zeppelin, the *LZ-130*, rapidly nearing completion.

And this attitude is not mere heroics. Airship men really believe that the rigid dirigible is a reliable means of transportation. Disasters? Of course they encounter disasters. "What mode of transportation does not?" is their argument. And they make a pretty good case for the airship, too.

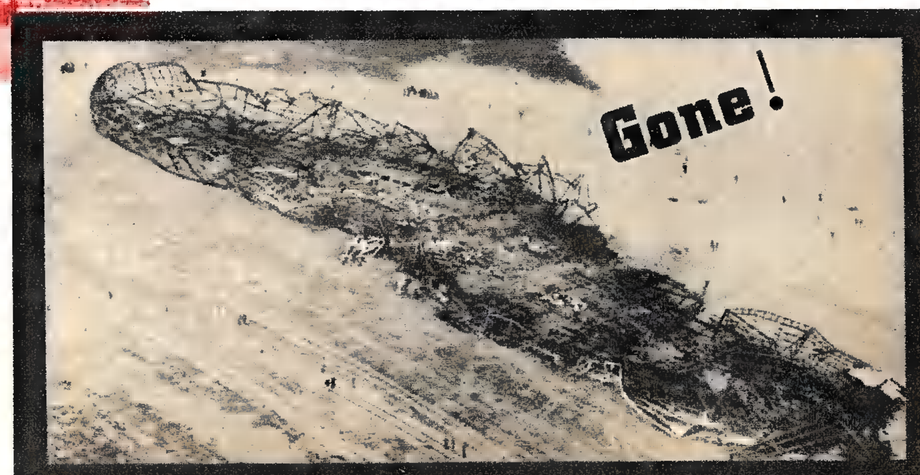
They will tell you, for instance, that dirigibles have carried more than 250,000 paying passengers, yet up until the time 12 of the 36 passengers on the *Hindenburg's* last trip were killed at Lakehurst, not a single passenger of any airship had ever lost his life.

You don't believe this? Well, here are the figures. On the three commercial Zeppelins built and flown before the World War, 37,250 passengers were carried without even a serious injury. Immediately following the war, the *Nordstern* and the *Bodensee* carried several thousand passengers before being seized by the Allies. Goodyear blimps have carried 180,000 passengers in perfect safety, while the *Graf Zeppelin* and the *Hindenburg* carried 16,000 on regularly scheduled runs.

As to crew casualities, aside from one blimp pilot and two members of a ground crew killed when their ship was wrecked in a violent gale, after being torn from its moorings, no crew member of a commercial ship had been killed before the *Hindenburg* carried 24 of its 66 members to a fiery death.

There have been only 156 large rigid dirigibles built in the history of the industry. Twenty-nine of these were built and flown in Germany before the war. Several of the first ones were wrecked, but no one was killed. Count Zeppelin, a balloon observer for the Union Army in the American Civil War, devoted practically his entire lifetime to building and flying

Clouds of smoke still rise from the twisted steel frame (above) of the ill-fated airship as rescue workers arrive to search for possible survivors. The *Hindenburg* had just completed her 21st crossing from Germany to the U. S. when the tragedy that caused the world to gasp in horror occurred. Right—Aerial view of the airship's charred remains at Lakehurst base.



RACING THE HOMING PIGEON

by
W. R. Stamford

Thwarting human explanation for centuries, homing pigeons miraculously return to lofts many miles away.

RACING the homing pigeon is a very interesting sport, and yet there are many people who are unaware that such a sport exists although it is one of the leading sports in England, Belgium, Germany and other European countries. To give one an idea of the vast number of racing enthusiasts participating in this sport in these countries as well as the United States, the following figures are presented:

There are some 300,000 fanciers in England, 35,000 in France, 350,000 in Belgium, 10,000 in Germany, 20,000 in Holland, 8,000 in Italy, 3,000 in Portugal, less than a thousand in Switzerland, about a thousand in Austria and 10,000 in the United States; a total of some 800,000 fanciers and this is not counting the fanciers in Brazil, Spain, Poland, Cuba, etc.

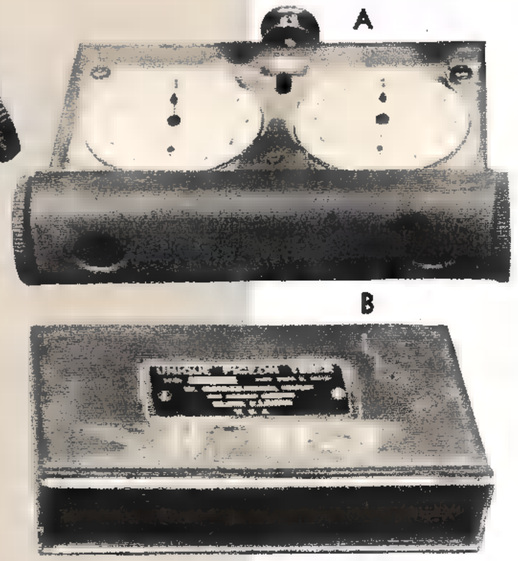
Mons. Hansenne, a Belgian who lived in Verviers, was, before his death, a most noted racing pigeon fancier. His fame and reputation as a breeder are known throughout the racing pigeon world. During the last three years of his life, he averaged $15,000 a year from the sale of his birds and their winnings. One of his favorite racers, "Good Blue," won $10,000.

J. W. Logan, an Englishman, is known to have sold a pair of his birds for over $1,400. A few years ago a Dr. Anderson, of Scotland, paid to Mons. Stassart, of Belgium, $1,000 for "Epinard," one of the greatest champion birds he ever owned.

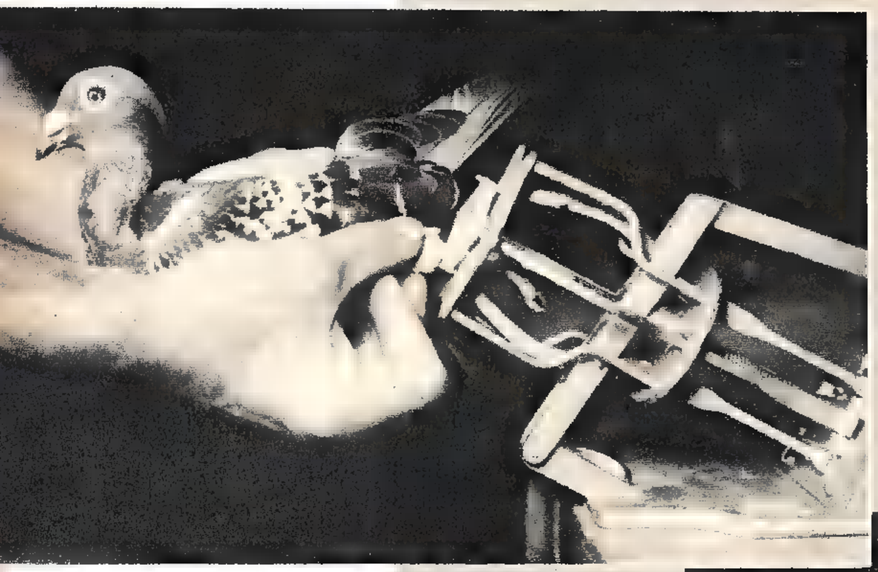
European birds and their progeny have performed wonderful feats, but some of the records of the U. S. birds are really extraordinary. The conditions they must fly under in this country are very trying. On the Pacific coast they have to contend with the terrific heat blown in from the desert, flying over the mountains four to five thousand feet high. Over these mountains they must come on their way home from a race, as there is no easier way round. In the central part of the country they encounter dust storms, strong head winds and intense electrical storms, which arise out of nowhere. Along the Eastern seaboard they have to fly over the high Allegheny Mountains which are nesting

Shown above is the liberation of almost 1,000 pigeons at Wilmington, Delaware, for a race to New York. A blue checker hen led the field, making a flight of 112 miles in 2 hours, 6 minutes. Right—"Swiftwing," blue checker cock, winner of the Chattanooga National Race in 1936. Owned by F. E. Gorely, of Washington, D. C., this pigeon flew 534 miles at average speed of 1036.42 yards per minute.

Sealed timing devices (left) are used by pigeon fanciers' clubs. When a bird "homes" in a race, the fancier removes a countermark from its leg and places it in either of the timer's two holes. Turning a dial locks the countermark in timer and stamps the time on slip.



The important parts of a "stop and start" timer are shown above. When timer is to be used, the nut A is unscrewed from post. Both clocks are wound and case B is then slipped over timer and nut A replaced, a string and seal being attached to it. Returned pigeons' countermarks are inserted in the holes.



The manner in which pigeons are countermarked before a race is clearly shown in the photo at left. Notice how rubber countermark is stretched to allow the bird's foot to be placed through it. When the handle is released, the countermark automatically flies off prongs onto the bird's leg. Below — Countermarked, the bird is ready for shipment to the point of liberation.

grounds for fierce hawks. Is it any wonder why the racing pigeon fancier becomes so attached to his little feathered racers?

How are racing pigeons trained? When young racing pigeons are 7 to 10 days old a seamless aluminum band is placed on one of their legs. As the bird's leg and foot grows, the band will soon be impossible to remove. On the band is stamped, in raised letters and figures, the initials of the organization to which the fancier belongs, year of hatch, initials of the fancier's club, and a number.

At 12 weeks of age, when these young racing pigeons—called youngsters—have become settled to their loft, they should be exercised 30 minutes or more each time they are let out of their loft by their owner. This exercise strengthens their wing muscles, develops the respiratory organs, and gets them familiar with the country surrounding their loft, developing their instinct.

Birds that are let out to exercise hungry should "trap" into the loft when they alight after the exercising flights. "Trap" is the racing pigeon fancier's word for birds entering the loft. If the birds were put out to exercise not hungry, they would soon get into the habit of loafing on top of the roof once they lit. This is the worst habit a racing pigeon can have, and unless it is corrected as a youngster, the bird is of no use to its owner. A pigeon race cannot be won if the bird sits on the roof when homing from a race.

Young birds should be ready for their first training "fly" at the age of four or five months. They are taken about a mile away from their loft in baskets and liberated. On these "flys" the birds are taken away hungry, so that when they return to their loft they will "trap" into it. The above distance is gradually increased to 15 miles, then to 25 miles, etc. After the birds are thoroughly trained up to 60 miles, they will in most cases be ready for their first competitive race, which is 100 miles. Old birds that have been inactive during the Fall, Winter and early Spring months will need a few training flights previous to the "old bird" race, to freshen their memory and sense of direction, but they, like the young birds, must exercise during the races.

There are two series of races every year for the fancier, provided he lives in a city where pigeon races are conducted. These series are known as the "old" and "young" bird races. The old bird races are for birds bred previous to the year in which they are to compete, while the young bird races are for birds bred the same year in which they are to compete. The old bird race schedule consists mostly of 100, 200, 300, 300, 400, 500, 500-mile hops and generally ends with one 600-mile race, although special races are sometimes held by clubs for longer distances such as 700 and 1,000 miles. This series of races starts about the first of May and

W. O. Maybury, said to be the oldest pigeon flyer in Pittsburgh, Pa., shrewdly inspects his champion bird before start of a race. The physical condition of a bird is only one of the factors that worry racers. Winds and type of terrain en route are equally important.

Homing pigeons were used by both sides during the World War. Pre-eminent was the work of "Cher Ami," shown above. Liberated with an important message during intense machine gun and artillery action, this bird flew 25 miles to deliver its message. Examination showed that one leg had been amputated and its breast pierced by a machine gun bullet. The message tube, intact, was hanging by a ligament. Below—"Spike," another battle veteran.

At Fort Monmouth, N. J., the U. S. Army Signal Corps maintains lofts (below) for breeding and training of pigeons. During the St. Mihiel drive in the World War, 567 birds were released with messages, attesting to their importance in large scale military operations.

Just what prompts and enables pigeons to return to lofts located hundreds of miles away has never been satisfactorily explained. The birds are taught to believe that food can only be obtained at the home loft, but what guides them unerringly over mountains and plains to their respective lofts? (Photos on pages 54-55 by courtesy of the U. S. Army Signal Corps.)

continues until mid-summer. The young bird race schedule generally consists of 100, 100, 130, 200, 200 and ends with a 300-mile race, this series starting a few weeks after the old bird schedule is completed and lasting until the Fall months. Short races are flown in most cities on Sunday, and the longer ones on Saturday.

Birds that are entered in a race must be countermarked at the fancier's club house on the night preceding the day of the race on short races, and two nights ahead for longer races. A small charge is paid by the fancier for each bird entered in the race, a countermark being received for each bird. A countermark is a rubber ring with two different numbers stamped upon it—one number inside, the other outside. The countermark is attached to a stub of paper called the countermark stub, which has the same numbers stamped upon it as the marker itself. When a bird is countermarked, the countermark is placed on the bird's leg (by a hand-operated appliance made for this purpose) and at the same time the bird's band number is written on the stub from which it was removed. This stub is then placed in an envelope (which has the fancier's name on it) together with other stubs, if he is flying more than one bird, and sealed. All competing birds must be countermarked by this method.

The countermarked bird is then placed in the club's shipping basket. These baskets are of different styles and hold about 50 birds with space to feed and water them when they are on the longer races. Straw or shavings are placed on the bottom to keep them in a sanitary condition. When the shipping baskets are filled with countermarked birds, the doors are sealed shut with regulation club seals and sent to the railway express station. After the shipping costs for the baskets are paid to the express agent by the club secretary, they are then placed in charge of the convoyor who directs the placing of the baskets in the railway express car, which has been hired for this purpose by the various clubs. A convoyor is a person sent with racing pigeons whose duty it is to liberate them the morning of the race, weather permitting. On the long grinds such as the 300, 400, 500 and 600-mile races the birds are fed and watered in the baskets by the convoyor at the race site station on the day previous to being liberated.

How a liberation is conducted and prepared is told in *The American Racing Pigeon News* by a man who has convoyed Pittsburgh, Pa., pigeons for almost two decades:

"About four days before I make a trip

[*Continued on page* 124]

The two photos at the right show a close-up of one of the lofts at the Army Signal School at Fort Monmouth, N. J., and a series of the Army's extensive pigeon raising and training quarters. The pigeon's military value is established, the Japanese army maintaining 20,000 of them. Experiments are being conducted in which the pigeons wear tiny cameras strapped to their breasts, timed to take photos at regular intervals during their flights.

Inventions Needed in Field of Electrochemistry

An interview with Professor Colin G. Fink

Head, Division of Electrochemistry Columbia University

by Richard H. Parke

"THE young inventor looking for new worlds to conquer would do well to investigate the vast but little-explored domains of electrochemistry. Hundreds of new products and inventions difficult or impossible to discover during the countless ages of the past with mechanical skill alone are today readily possible through the combined power of electricity and chemistry."

Thus Professor Colin G. Fink of Columbia University presents an invitation — and a challenge—to inventive minds everywhere. He sees no reason why young men with courage and imagination should not play an important part in future scientific development and he believes his own field offers unlimited possibilities for advancement.

When I called on him in his laboratory at Columbia, I told him the readers of MODERN MECHANIX were particularly interested in needed inventions and I asked him to name a few of the problems which, in his opinion, demanded the greatest attention at this time.

"Our basic engineering metal is iron," he began. "It is the most abundant and has the most valuable properties, such as high tensile strength, high fatigue value, etc. The world produces more of iron and steel than all the other metals put together. For every 100 tons of iron and steel, only 2 tons of copper are produced—and copper occupies second place in quantity and importance among metals!

"With ever rapidly increasing utilization of steel in railroads, automobiles, bridges, buildings, high transmission towers and other articles, the problem of eliminating rust and protecting steel products and costly structures against corrosion is undoubtedly the biggest problem confronting the chemist and engineer. Metals rust as a result of electrochemical action. If we eliminate this, we eliminate rust! The young men of the coming generation will solve this problem; marked progress towards a solution already has been made.

"We are also badly in need of an electric source of illumination suitable to our eyes which will operate at 90 per cent or better in efficiency instead of less than 10 per cent as at present. Electricity is modern man's indispensable and versatile servant; eliminate it and civilization would drop back 100 years. But, although electricity has increased the efficiency of old hand-operated machines and innumerable devices a thousandfold or more, it has so far not accomplished anything near as much for artificial light.

"The tungsten lamp in the average man's home furnishes but 5 cents' worth of light for every dollar's worth of electricity. The balance, 95 cents, is lost as useless heat. Modern homes and towns need a lamp that will furnish at least 90 per cent light and only 10 per cent heat. The little firefly, or glowworm, operates its light at figures even better than 90 per cent. The lamp of the future may very well be based on principles similar to those of the firefly's glow.

"A simple means of electrically controlling rainfall—keeping it out of the cities—is another important problem to solve. The Cottrell electrical precipitation process is used at factories all over the world to precipitate fumes, dusts, smoke and vapors of all kinds. It requires very little development to apply this same process to the precipitation of rain in localities outside of towns and cities. Millions of dollars' worth of shoes, clothing

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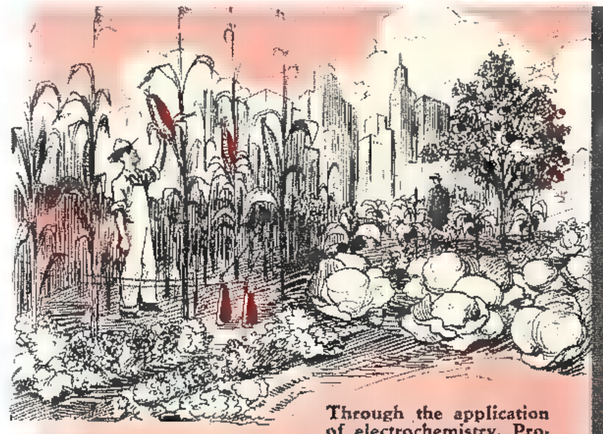
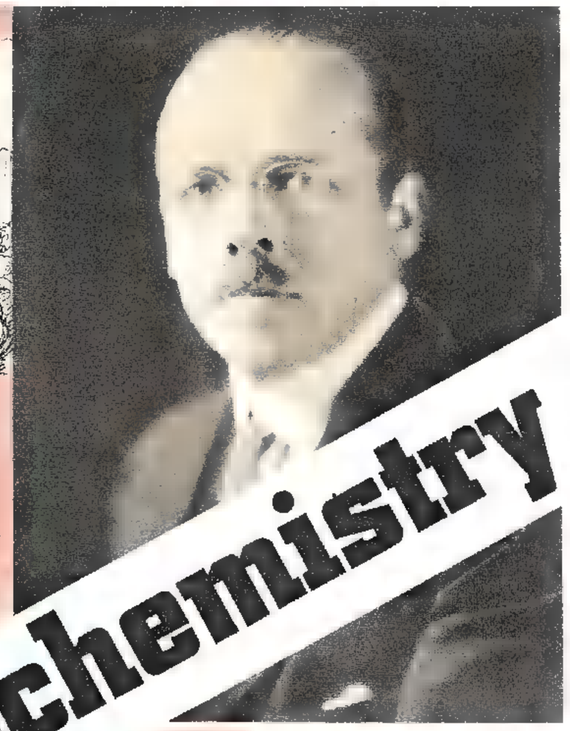
Scientists are baffled in their efforts to release gold from sea water cheaply.



Through the application of electrochemistry, Professor Fink believes that the growth of fruit and vegetables can be greatly increased and that metals can be prevented from rusting and corroding.



Winner of the Perkins Medal of the Society of Chemical Industry and the Acheson Gold Medal for outstanding accomplishments in the field of electrochemistry, Professor Colin G. Fink now heads Columbia University's Department of Chemical Engineering. Discoverer of a platinum substitute used in manufacturing incandescent lamps, Dr. Fink seeks lamps that will be ninety per cent efficient instead of ten per cent as at present.

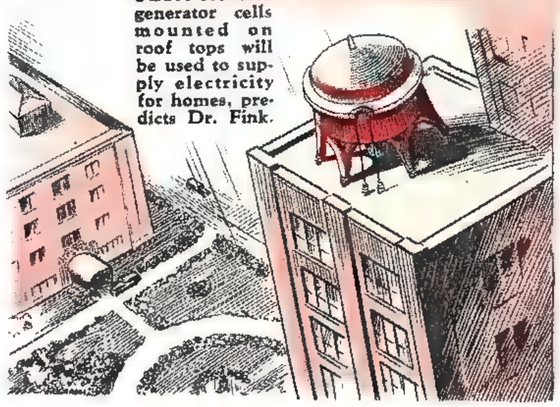


Photo-electric generator cells mounted on roof tops will be used to supply electricity for homes, predicts Dr. Fink.

RESTOCKING The OCEAN

Federal Bureau of Fisheries takes unusual measures to balance inroads made by commercial fishers.

Unloading a catch from one of the many fishing boats supplying the colossal public demand for this popular food. Nets make large scale catching possible in a minimum of time. Because of the relentless demand for salt water fish, restocking is becoming necessary to prevent extinction of popular species.

Top of page—Large numbers of persons now enjoy deep sea fishing on one of the many boats used for this purpose. With rods and reels, dozens of fishermen are taken to fishing grounds not usually available to the individual. Below—One of the reasons why fishing is one of the most popular pastimes.

by
C. S. van Dresser

WHAT is probably the largest undertaking of its kind in the entire history of man has recently been completed, for, fantastic as it may sound, the ocean has been restocked by human efforts!

This gigantic task was accomplished by the Federal Bureau of Fisheries which states, in part: "If all of the fish planted by the Bureau in the past fiscal year in the Atlantic and Pacific Oceans and in lakes and rivers were to grow to maturity and be caught, almost every man, woman and child in the United States could have approximately six pounds of fish every week for a solid year from this source alone."

The total was slightly over eight billion, and was composed of eggs, fry and fingerlings of forty-three different salt and fresh water species from eighty-four hatcheries in thirty-eight states.

But why go to all this trouble to put fish into the sea? Restocking streams and lakes seems reasonable, but the ocean is a vast place, covering three-quarters of the earth's surface. Won't the salt water fish wander off to Europe or South America after they've been planted? How does the Bureau know that there will be any benefit reaped planting fish eggs and fingerlings in the boundless sea?

The answer is, and most definitely, that the Bureau does know what will happen to a good majority of the eggs and fish it releases in Old Father Neptune's domain. This knowledge came about after long and arduous study of ocean currents (known as oceanography) and years of so-called "tagging" of various fishes to learn their migratory and spawning habits.

The story of fish tagging is a tale in itself, but suffice it to say that by identifying fish by attaching tags on the fleshy part of the tail, or clipping certain fins and several other methods, the Bureau has unquestionably established many facts, such as: large quantities of codfish lay their eggs in Massachusetts Bay, and ocean currents carry them to the famous Georges Banks, 150 miles away, just in time to be hatched; that weakfish, a valuable commercial fish of New Jersey, go south to Chesapeake Bay and the Carolinas during winter to spawn; that salmon, whenever possible, return to the identical stream where they were hatched to spawn and die.

These are but a few instances of what the Bureau has learned about the habits of the denizens of the deep. So, when it plants six billion eggs and young fish in the Atlantic Ocean, you may be sure then an appreciable amount of them will end their careers in the frying pan of Mr. and Mrs. America. With rare exceptions, our native salt water fish do not leave our shores.

Backing up this statement are the scientists of the Rockefeller-endowed Oceanographic Institution of Woods Hole, Mass., whose studies of ocean life have extended in the Atlantic from Labrador to the Equator. They state, without qualification, that

A Bureau of Fisheries scientist picking out unfertilized eggs preparatory to planting in suitable spawning grounds on the Georges Banks, off the New England coast. Six billion eggs were planted.

A Bureau rescuing unit salvaging fish trapped by overflow waters of the Mississippi River. More than 47,000,000 fish were saved this manner during the past year and replanted up-stream.

Removing fish from overflow waters during floods, for transfer to other sections of the country. This work saves many million fish which might have been killed when the flood waters subsided.

marine life hardly exists over 200 miles from shore. In other words, our salt water fishes remain close to home.

The Bureau of Fisheries scientists know where and when various fish spawn, where they migrate to (when they do migrate) and act accordingly in their vast propagation activities.

Naturally you're not going to eat six or seven pounds of fish a week, unless you're more than crazy about sea-food or live in Alaska. So why this extensive planting of fish—the largest that the Bureau of Fisheries has ever accomplished in one year?

Take one of our best known commercial fishes—the cod, for example; for the past several decades we have consumed on an average of one hundred million pounds annually of this single staple marine product and practically all of it comes from the New England region alone! That gives an idea of the amount of fish we eat. Bear in mind the dozens of kinds of fish on the market today from our diversified and many fishing grounds, and it will be readily agreed that, taking the cod as an example, the American public consumes a staggering amount of fish.

By far the greatest fisheries in the United States are those off the New England coast. They extend, roughly, from the east end of Long Island Sound to Nova Scotia and the Newfoundland Banks. These grounds are more extensively fished than any others in the entire country. Huge fleets of fishing boats leave almost daily from Boston and Gloucester, Mass., and Portland, Maine, as well as numerous smaller ports. (The fish pier at Boston is the largest of its kind in the world devoted exclusively to receiving and packing fresh fish.) The aggregate catch of these ports is colossal.

Better equipped and more numerous boats are bringing in seafood delicacies at such a rate that nature, lavish as she is, cannot keep up with the inroads man is making. Today the fishing fleets must make longer and longer trips to get satisfactory hauls. Several important species are becoming alarmingly scarce. Yet the demand for cod, haddock, flounder, mackerel and other salt water products goes on relentlessly. This depletion does not confine itself to New England alone, for, according to Bureau scientists, it is true in varying degrees in practically all of the nation's commercial and sports fishing areas.

Perhaps the public does not realize the situation, but five years ago the Bureau of Fisheries foresaw that unless something drastic was done, our fisheries would within a short time face an economic crisis. This huge industry, with its ramifications, employing many thousands of workers, might conceivably cease to exist—and more than that—a tremendous source of food be denied the entire nation.

What to do? Only one thing—increase the number of fish in the ocean and inland waters—somewhat of a job, especially the former. Whereupon two great hatcheries of the Bureau, one at Gloucester, Mass., and the other at Boothbay Harbor, Maine, began collecting eggs from fish caught during the spawning season. Knowledge of the proper way to treat and handle the precious eggs grew with experiments, till today, the Bureau of Fisheries announces that it has planted the greatest number of eggs and fingerlings of salt water fish that it has done in any one year in its entire history.

Close to six billion potential fish dinners are now on their proper beds on the great Georges Banks and along the coast of Massachusetts and Maine, either in the fingerling and young fish state, or in the form of eggs, ready to hatch. A most stupendous accomplishment!

Cod and flounder head the list, the former with over two billion and the latter with a billion and a half. Pollock, a valued commercial fish resembling the haddock, makes its initial artificial spawning bow by placing third with over a billion. Haddock is represented by a mere 500 million, while the neglected mackerel has only an insignificant 100 million of its progeny planted

[*Continued on page* 122]

Young fish being disinfected at one of the Federal Bureau hatcheries. After these fingerlings are immunized against disease they are released in waters suitable for their healthful growth.

Planting bass fry in fresh water lake. More than four million bass were deposited in lakes and rivers throughout the United States in the largest propagation program ever carried out by the bureau.

Bureau of Fisheries field man unloading fingerlings into a container preparatory to planting them in suitable water. There they will grow to maturity and stem the flow of many species toward extinction.

So You're Buying a House!

by Alfred Dolid

ATTRACTED by the low prices made possible by large-scale, government-sponsored production, thousands of families of modest income are buying homes throughout the country. The summer of 1937 will see a building boom of unequalled size, according to realtors everywhere.

The advertised prices of comfortable five- and six-room houses appear so reasonable, and the terms of payment so convenient, that many people hurriedly purchase dwellings in desirable and rapidly filling communities and learn only afterward that the down payment and the monthly installments do not cover a really complete home; they discover to their dismay that the "extras" add up to a considerable sum, sometimes an appreciable fraction of the purchase price.

Builders have found that average prices of $5,000 for a one-story house and about $6,500 for a two-story structure draw the greatest number of prospective buyers, mainly because the carrying charges on these sums are smaller than rent for equivalent apartments. Such houses cannot include numerous accessories and attachments if they are to conform to the technical standards established by the government and still earn a legitimate profit for the builders. The latter therefore emphasize the minimum prices and simply do not mention the extras.

If you are in the market for a home, do not hesitate to ask many questions of the builders you meet. Start with the heating system, which is undoubtedly the most important single mechanical element in a home. You will be surprised to learn that standard equipment for the great majority of small houses is an old-fashioned coal furnace,

Left—Rock wool insulation, shown being installed in a top floor ceiling, is an efficient means of reducing fuel costs in winter and for lowering temperature in summer.

Right—A stout fence to keep children and animals off the lawn is good insurance for grass and flowers. Costs vary according to type and general construction.

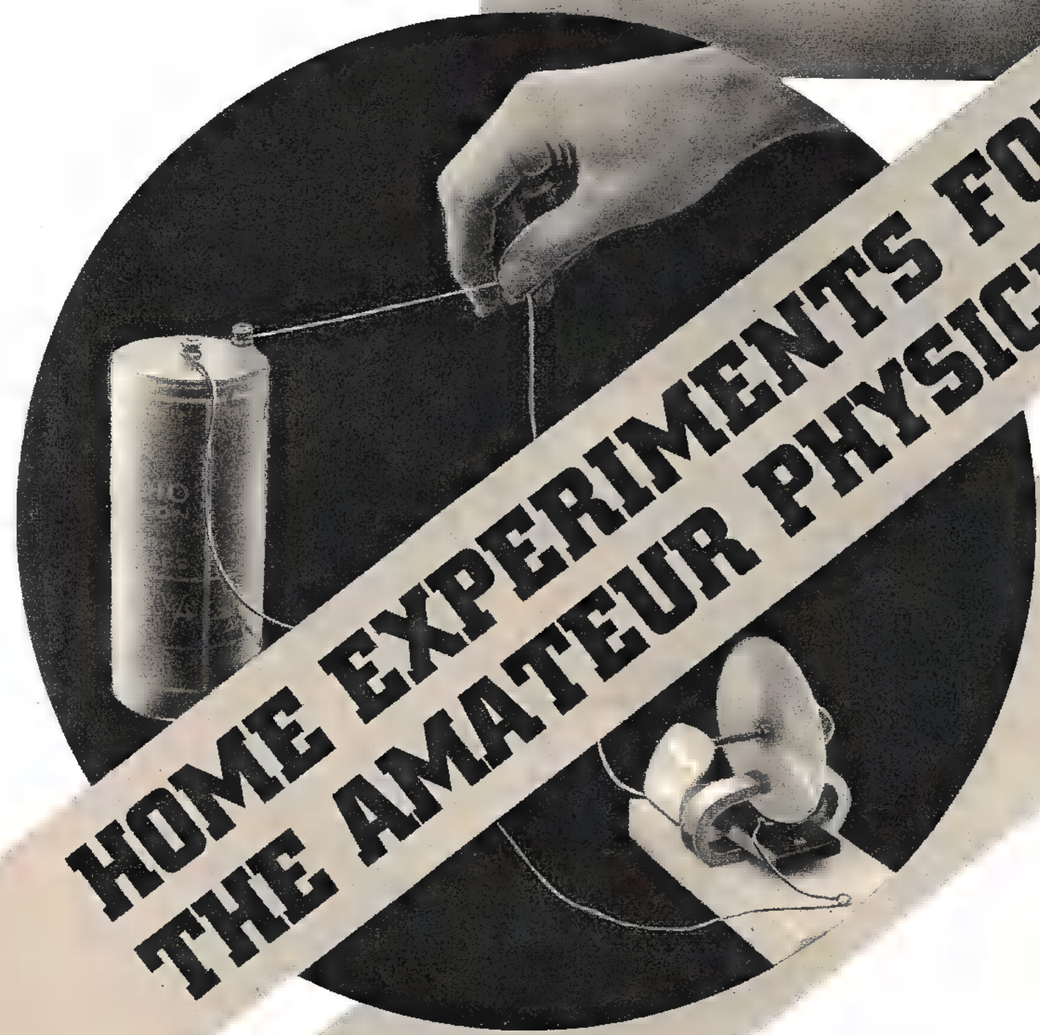
Above—Window screens for summer use are important comfort aids to the home owner. During the cold months, the screens should be replaced with storm windows, thus eliminating "cold zones" in the rooms. Right—A typical example of what can be done with an average cellar. Covered walls, floor and ceiling add a room to the house, suitable for any use. (Photo courtesy American Radiator Company's Castles Underground)

HOME EXPERIMENTS FOR THE AMATEUR PHYSICIST

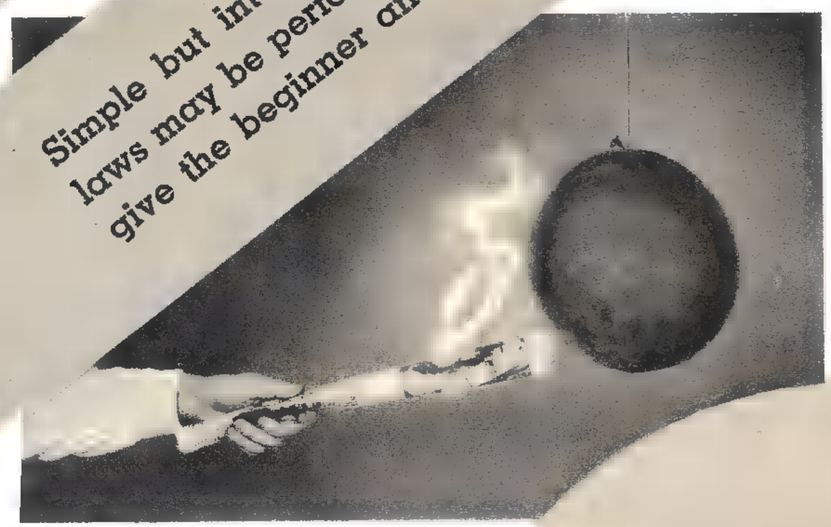
Simple but interesting demonstrations of fundamental physics laws may be performed with inexpensive equipment and will give the beginner an answer to many perplexing problems.

DEMONSTRATE STEAM'S HEAT TRANSMISSION QUALITIES—Water in a test tube is boiled and the steam carried into a glass of water by means of a rubber tube. In a short time the water in the glass will be heated although the condensed steam has added very little water to that already in the glass. Steam in addition to being hot gives up a large amount of heat when it changes to water.

BALLOON LOSES HYDROGEN FASTER THAN AIR—The balloons in the photograph originally were the same size. After fifteen hours they were as shown. The small one contained hydrogen and the large one air. The hydrogen molecules pass through the rubber with less difficulty than air molecules because of their being smaller in size.



A REVOLVING COPPER DISC—A copper disc will revolve between the poles of a magnet if direct current is allowed to flow from center to edge or edge to center of the wheel. A drop of mercury supplies the contact for the current at the lower portion of the rim although very light contact with a piece of wire also will work. The disc revolves because the part of the disc carrying current between the magnetic poles is constantly being pushed aside by the magnetic field.



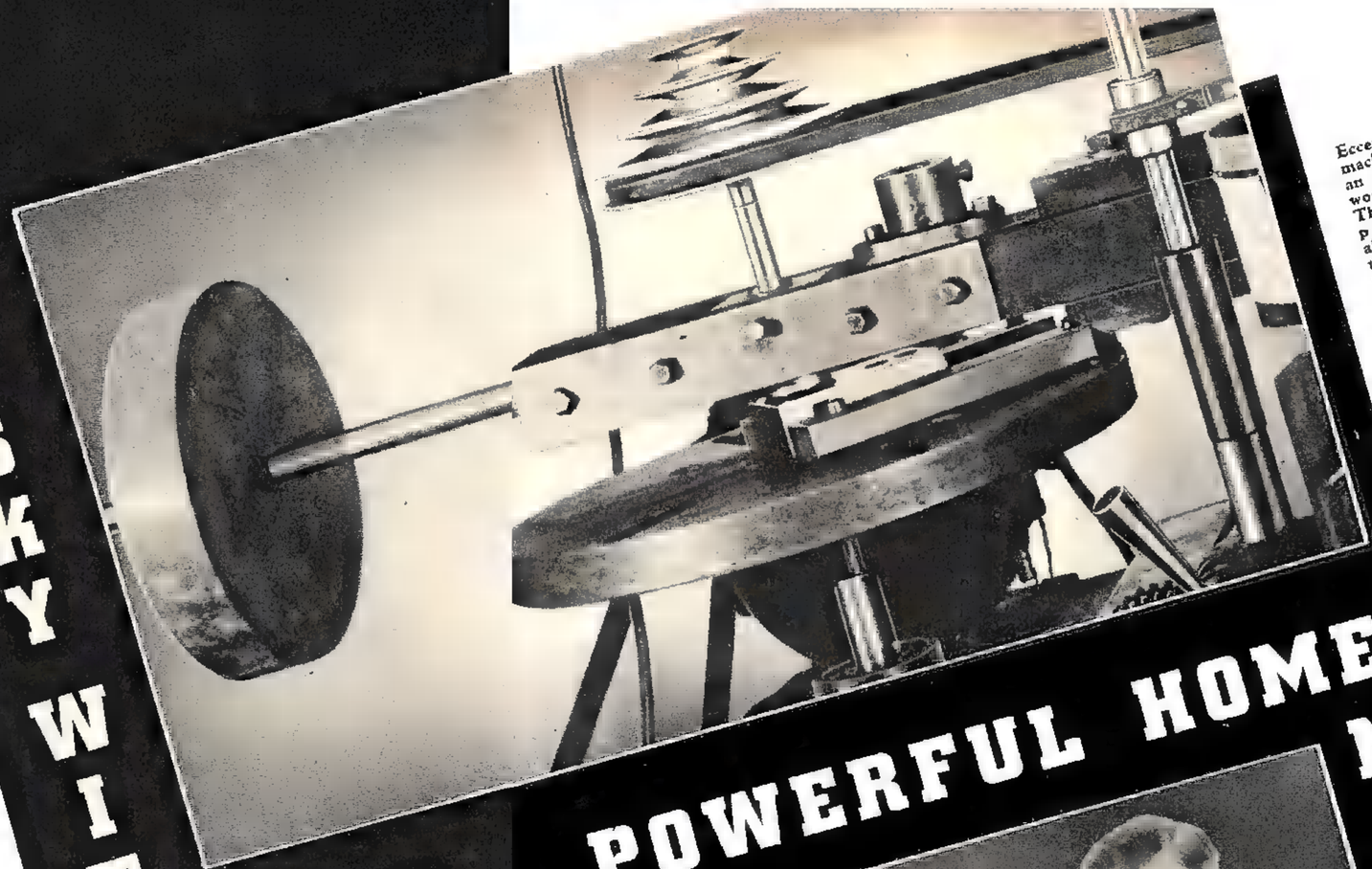
DILUTE HYDROGEN EXPLODES—Fill two balloons with hydrogen. Ignite one as shown in the photograph. It will blaze up with a puff of smoke. Permit the other to stand for several hours and then ignite in the same manner. This time it will ignite with a sharp "bang," indicating that air has mixed with the hydrogen.

MIRROR REFLECTS HEAT—To demonstrate heat reflecting qualities of a mirror use metal one instead of glass. A piece of shiny tin will be satisfactory. If a piece of glass is held in front of the heater, it will be found that it will stop the heat rays just as effectively as did the sheet of opaque material.

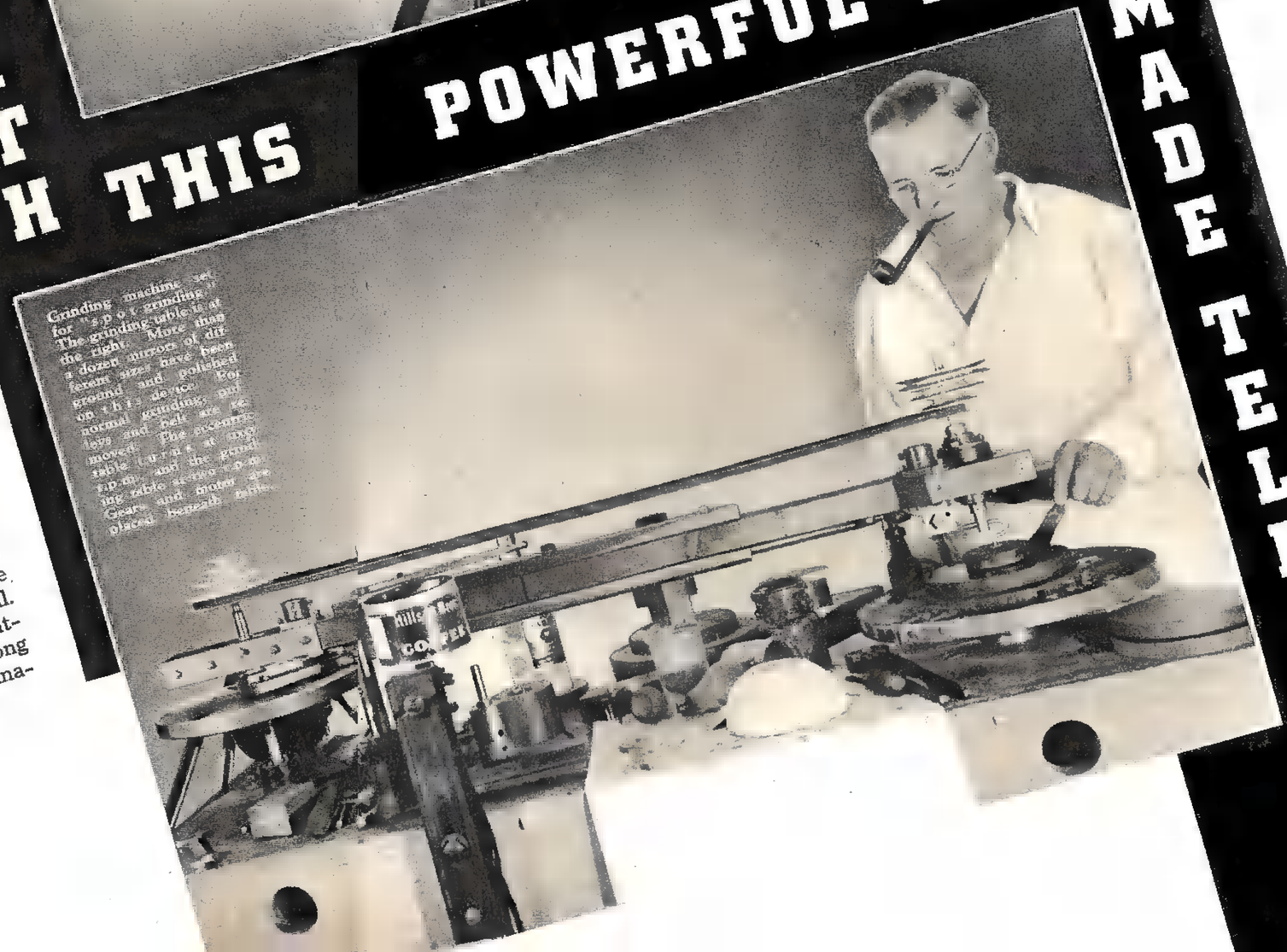
5 CAN THE SKY WITH THIS POWERFUL HOME-MADE TELESCOPE

The pride of having constructed this instrument will add new pleasures to star study.

by R. DeWitt Miller



Eccentric of grinding machine constructed by an amateur telescope worker of Los Angeles. The shaft carrying the pulley may be slid along the slot beneath the grinding arm so as to give the eccentric motion for normal grinding and polishing. The pulley and the belt are removed for normal grinding. The photograph was taken when the machine was set for "spot grinding."



Grinding machine set for "spot grinding." The grinding table is at the right. More than a dozen mirrors of different sizes have been ground and polished on this device. For normal grinding, pulleys and belt are removed. The eccentric table turns at sixty r.p.m. and the grinding table at two r.p.m. Gears and motor are placed beneath table.

PART I

THERE is no field open to the home craftsman which gives more lasting and satisfying results than the making of reflecting telescopes.

A simple six-inch reflecting telescope, the construction of which will be described in this series of three articles, will open up a glorious celestial world and give the star-filled vastness of the night a new meaning. The study of the heavens enrichens any man's life.

Such a six-inch reflector will show the polar caps on Mars, the unearthly beauty of the moon phases of Venus, the moons of Jupiter, the rings of Saturn, and the companion star to Polaris. It will split "double" stars. Through it the moon becomes a close neighbor, only a little way out in space.

There is another, and equally satisfying, side of telescope making. That is the joy of dealing with scientific accuracy so exact that it makes the average home workshop project seem gross and almost crude. To see your handiwork pass a test which is accurate up to a millionth of an inch is a deep and lasting thrill.

Add to these factors the fascination of the work itself and the fine friendliness which exists among amateur telescope makers and you have a combina-

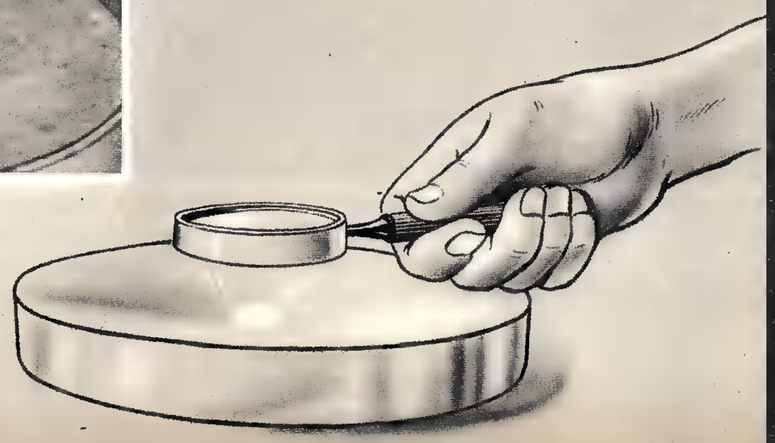
[*Continued on page 76*]

tion that is hard to beat. As to the equipment necessary, it is far less elaborate than is imagined by the average workman. Of course, each worker in the field has a great many special gadgets and pieces of equipment which he believes essential. In truth, they are essential only to his particular technique. One of the purposes of this series of articles is to strip telescope making to its true, and remarkably simple, essential.

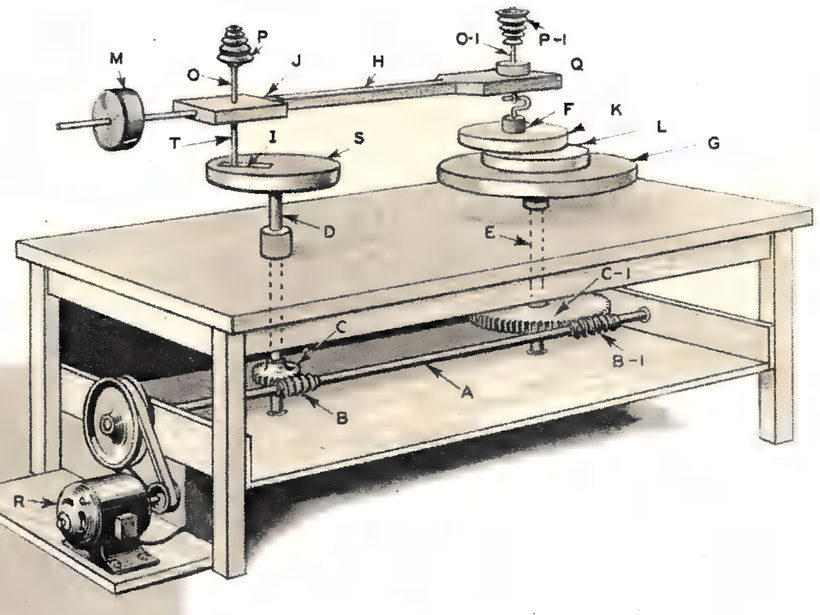
On the other hand, it is obviously impossible to cover the whole field of telescope making and optical calculations in articles of this length. The broad outlines will be sketched and the major steps described. For the rest, the worker will have to rely on his own good judgment and understanding of mechanics to get him over the minor difficulties which are bound to arise. The worker who wishes to study the subject in more detail is referred to the numerous books on the subject.

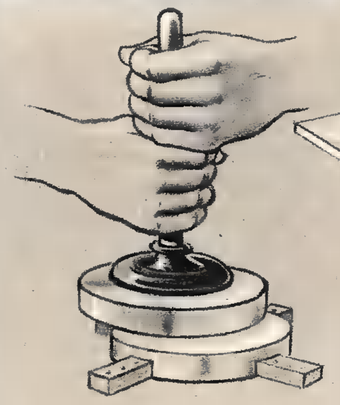
During the grinding, polishing and testing of a mirror, the simplest home workshop, so long as it has an assortment of common tools and a good, solid workbench, will be sufficient. The only truly essential thing is a good lock on the door, with the key reposing in the worker's pocket. Mirrors are very sensitive to heat, cold and shock. They do not make ideal playthings for Junior. The workshop must never be dusted while a mirror is in process of grinding. Particles of the rough grinding abrasive will

Left—Mirror being polished by hand. The table shown is set in a heavy movable base. However, a barrel is a good substitute for the table. For grinding, a glass "tool" is used instead of the pitch lap shown. Below—Examining the surface of the mirror for pits. A reading glass is used for this test. An out-of-focus sun spot reveals pits and scratches on surface of mirror.



A drawing of the mirror grinding machine. Power obtained from the electric motor is transmitted to the two turntables through the shaft A. Gears reduce the speed to sixty r.p.m. for the eccentric table S, and to two r.p.m. for the grinding table G. The slot I makes possible adjustment for the eccentric motion of the arm H. This arm is hinged at J to allow removal of the mirror K from the "tool" L. The belt for connecting the two pulleys is not shown. M is a counterbalance for adjustment of pressure of mirror against "tool."





Above — Diagram showing method of grinding mirror by hand. A "plumber's friend" is used as a handle for the mirror. A glass "tool" is under the mirror. Blocks of wood are used to hold the "tool" in place during grinding operation.

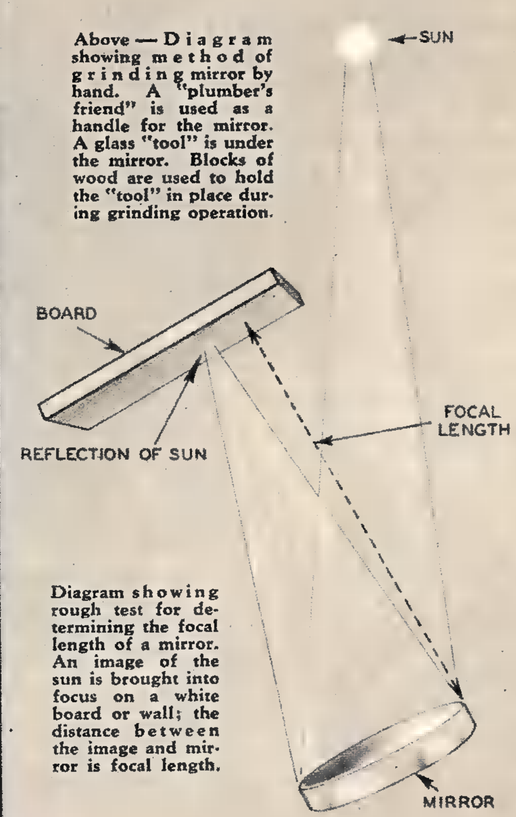


Diagram showing rough test for determining the focal length of a mirror. An image of the sun is brought into focus on a white board or wall; the distance between the image and mirror is focal length.

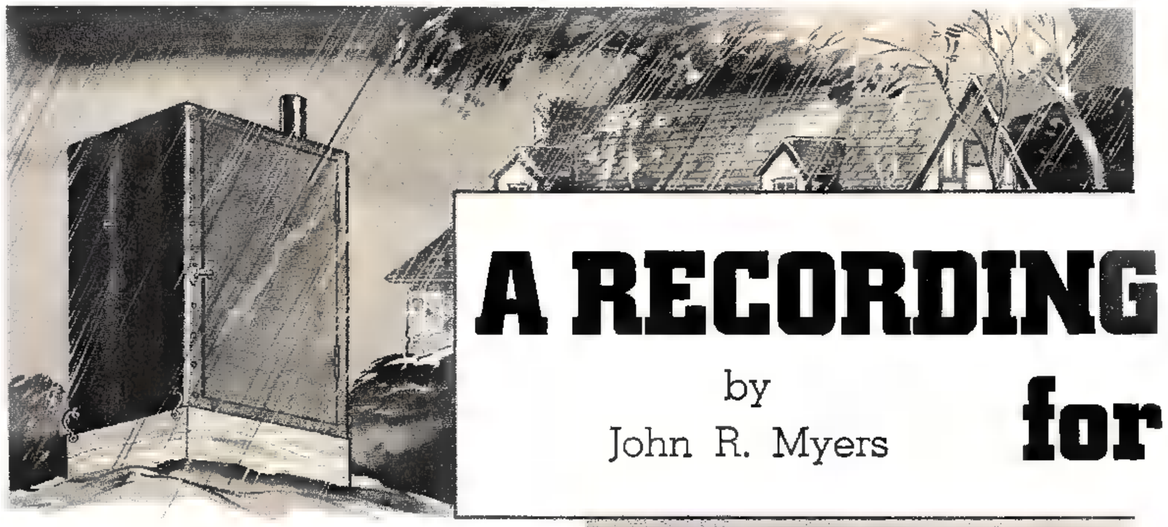
invariably get on the surface of the mirror and scratch it. Therefore, women with dusting apparatus must be relentlessly kept outside. The only known way to do this is with a lock.

If it is planned to place the mirror in one of the more elaborate metal mountings, certain power tools will be found necessary, or at least a great help. This however, will be discussed in the third of this series of articles, which deals with types of mountings.

There is one other necessary piece of equipment—a mechanical bent of mind on the part of the workman. This problem, however, usually solves itself, as anyone interested enough in telescope making to attempt it seriously is almost always at least a passable workman.

The following items and equipment are necessary to begin the grinding and polishing of a six-inch mirror. (A mirror of that size has been chosen for this discussion because it is simple to grind. If it is designed to have a speed of F. 11, it need not be made parabolic. However, mirrors from four to ten inches may be ground with only slight variations in the methods described in this series of articles.)

The items in this list are the bare minimum necessary to attempt to grind a mirror:



Operated by an alarm clock mechanism, this recording rain gauge provides the amateur meteorologist with a very accurate weather station instrument.

A RECORDING RAIN GAUGE for amateur weathermen

by John R. Myers

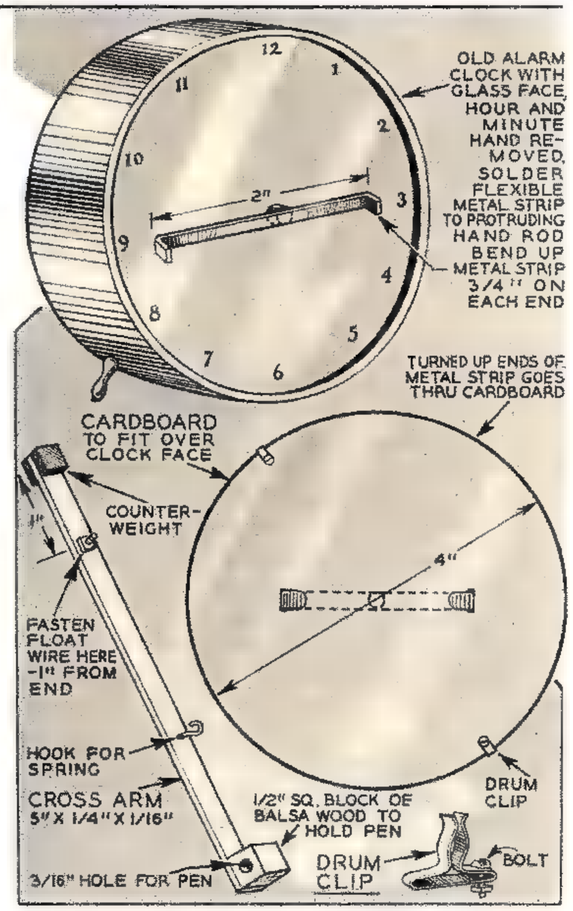
THERE are few subjects, if any, that create more general interest than the weather. If you are like the average American, the first item you read, when you pick up the evening paper, is the general forecast of weather conditions. The study of the weather in all of its many phases provides an interesting hobby that can be pursued by any man or boy.

A recording rain gauge is only one of the many homemade weather instruments that will find practical application in the amateur meteorologist's observatory, but the building of this interesting device will definitely prove the merits of this hobby and spur you on in making other forecasting instruments. The rain gauge, about to be described, not only indicates, graphically, the exact amount of fall, but shows, directly on the graph cylinder, when the rain began and when it ended. Though its accuracy is comparable with the most costly of laboratory instruments, this recording gauge can be built for less than two dollars.

Procure, first, a one dollar alarm clock, with a three-inch diameter face, to be used for rotating the recording drum. Remove the glass face and also the hour and minute hands, then to the minute hand rod, solder a strip of metal about 3½ inches long with the ends bent up about ¾ inch at both ends, at right angles to the face of the clock.

Cut a disc from stiff cardboard 4 inches in diameter and to it fasten two right angle clips of ¼-inch flexible steel. They should be placed opposite each other, 3¾ inches apart and fastened to the cardboard with small bolts. The clips serve to hold the recording drum on the face of the clock.

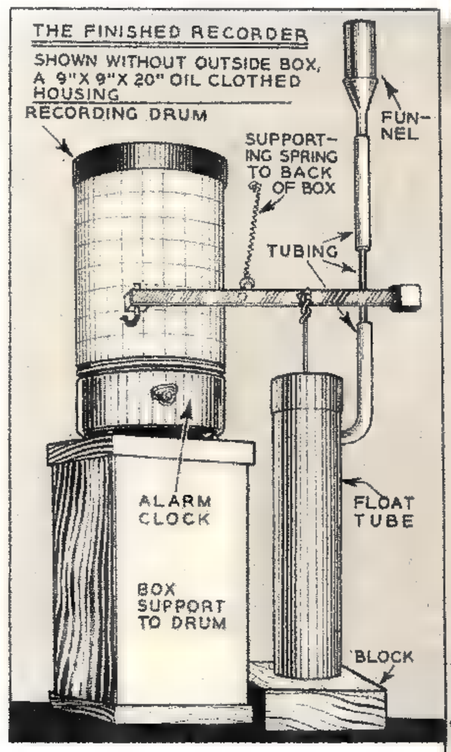
Punch two holes in the cardboard disc for the upturned ends of the strip soldered to the clock shaft. The cardboard disc is next set in place with the two metal ends protruding from the slots provided for them after which the two metal upright strips are clinched to hold the disc in permanent position.



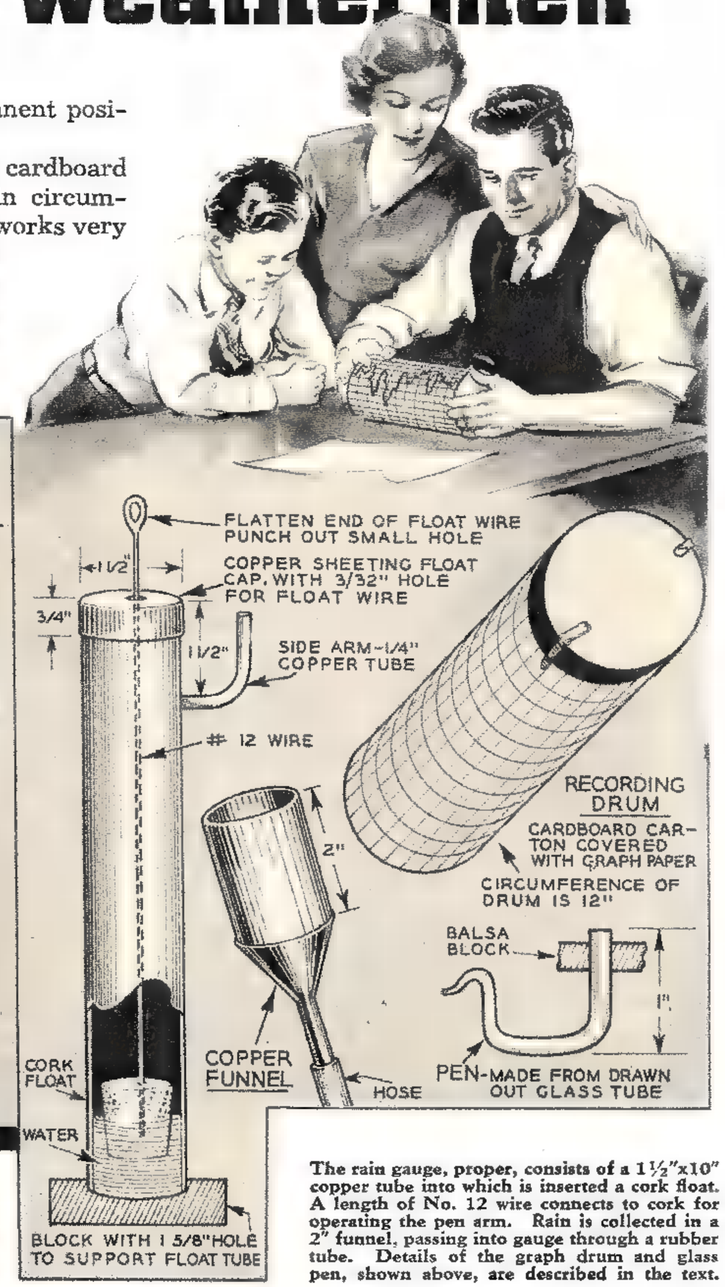
The rainfall for a given period is recorded on a cylinder to which is fastened a graph paper chart. An alarm clock, from which the face and hands have been removed, is fitted with a metal strip, soldered to the hour hand, to permit attachment of the chart drum, as shown above. Details of pen holder, drum clip and disc for supporting the chart drum are also indicated.

For the recording drum, get a cardboard carton that is exactly 12 inches in circumference. An empty salt container works very satisfactorily. The two right angle drum clips will hold a drum of this size in perfect position by cutting the bottom out of the drum so the

[*Continued on page* 130]



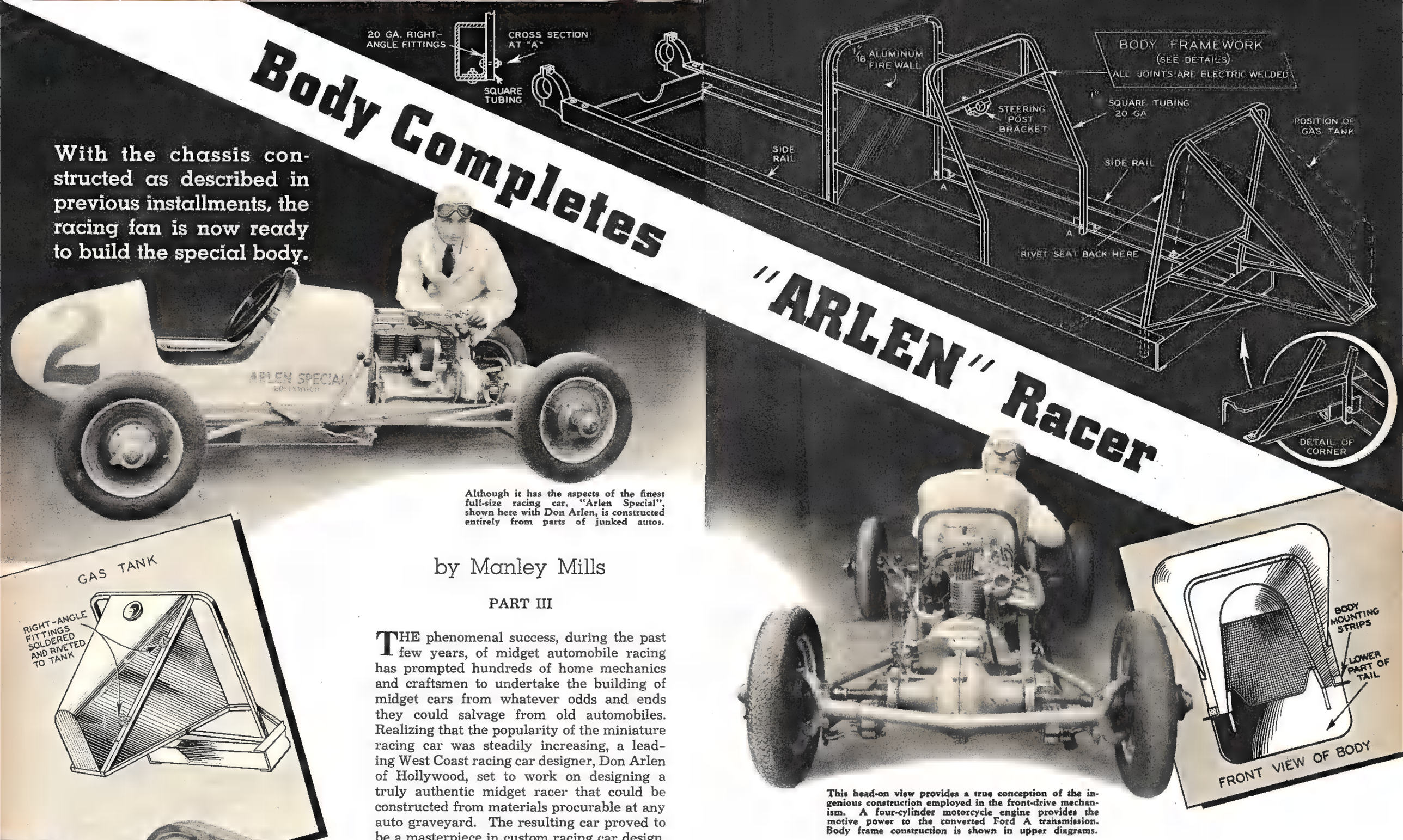
The rain gauge, as it appears when completed, is depicted here. When in use, the device is protected in a 9"x9"x20" oil cloth covered box. Mount the recording drum on a support of sufficient height so glass pen contacts chart.



The rain gauge, proper, consists of a 1½"x10" copper tube into which is inserted a cork float. A length of No. 12 wire connects to cork for operating the pen arm. Rain is collected in a 2" funnel, passing into gauge through a rubber tube. Details of the graph drum and glass pen, shown above, are described in the text.

Body Completes "ARLEN" Racer

With the chassis constructed as described in previous installments, the racing fan is now ready to build the special body.



Although it has the aspects of the finest full-size racing car, "Arlen Special", shown here with Don Arlen, is constructed entirely from parts of junked autos.

This head-on view provides a true conception of the ingenious construction employed in the front-drive mechanism. A four-cylinder motorcycle engine provides the motive power to the converted Ford A transmission. Body frame construction is shown in upper diagrams.

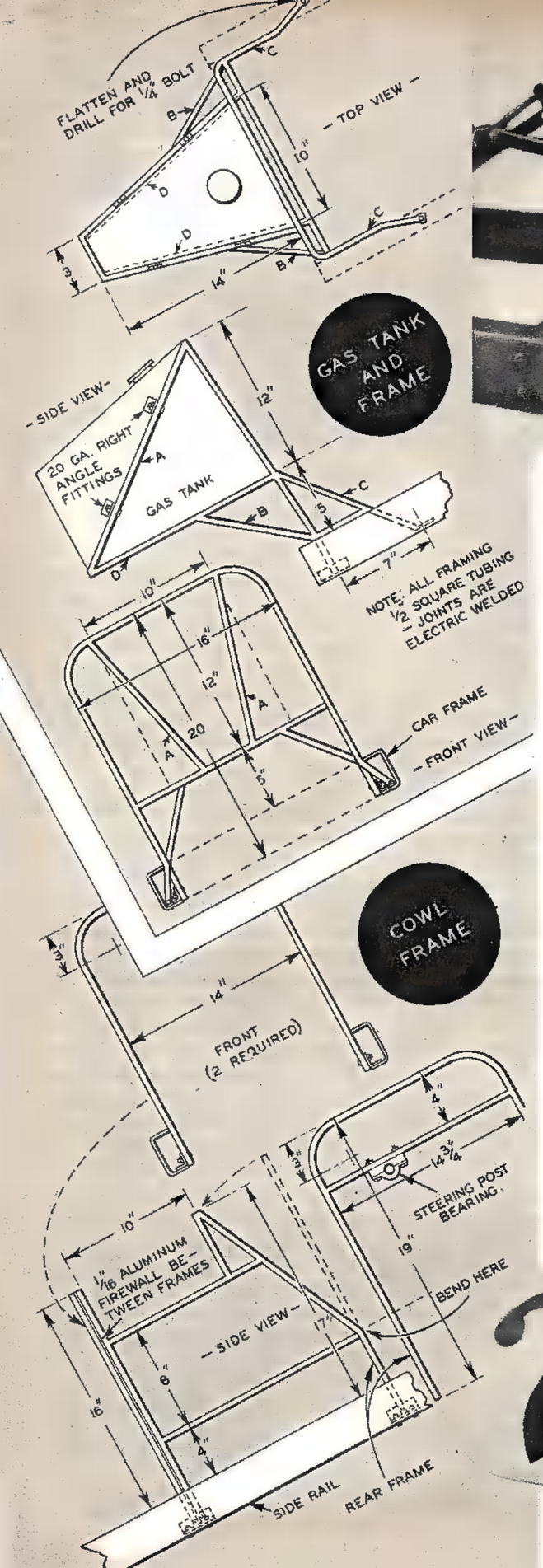
Left—The gasoline tank is constructed from galvanized iron and shaped to fit in the tail of the "Arlen" body. Tank is installed in a rack formed from ½" sq., 20-gauge steel tubing. Below this is shown completed instruments panel and cowl framework construction.

by Manley Mills

PART III

THE phenomenal success, during the past few years, of midget automobile racing has prompted hundreds of home mechanics and craftsmen to undertake the building of midget cars from whatever odds and ends they could salvage from old automobiles. Realizing that the popularity of the miniature racing car was steadily increasing, a leading West Coast racing car designer, Don Arlen of Hollywood, set to work on designing a truly authentic midget racer that could be constructed from materials procurable at any auto graveyard. The resulting car proved to be a masterpiece in custom racing car design, since it not only had been assembled from motorcycle and automobile parts, but featured a front-drive transmission—a feature usually found only on custom-built racers costing $2,000 or more. Probably the most amazing fact concerning Don Arlen's racer was the cost. After all work had been finished and the car was ready for its first run, a check-up on expenses showed that the total investment was less than $100, or about one-twentieth the price of a factory built car!

In the foregoing installments, which appeared in the June and July issues of MODERN MECHANIX, construction of the chassis, axle, steering and front-drive mechanisms for the "Arlen Special" were discussed in detail. The builder has now reached the point where he is ready for making the racing body.



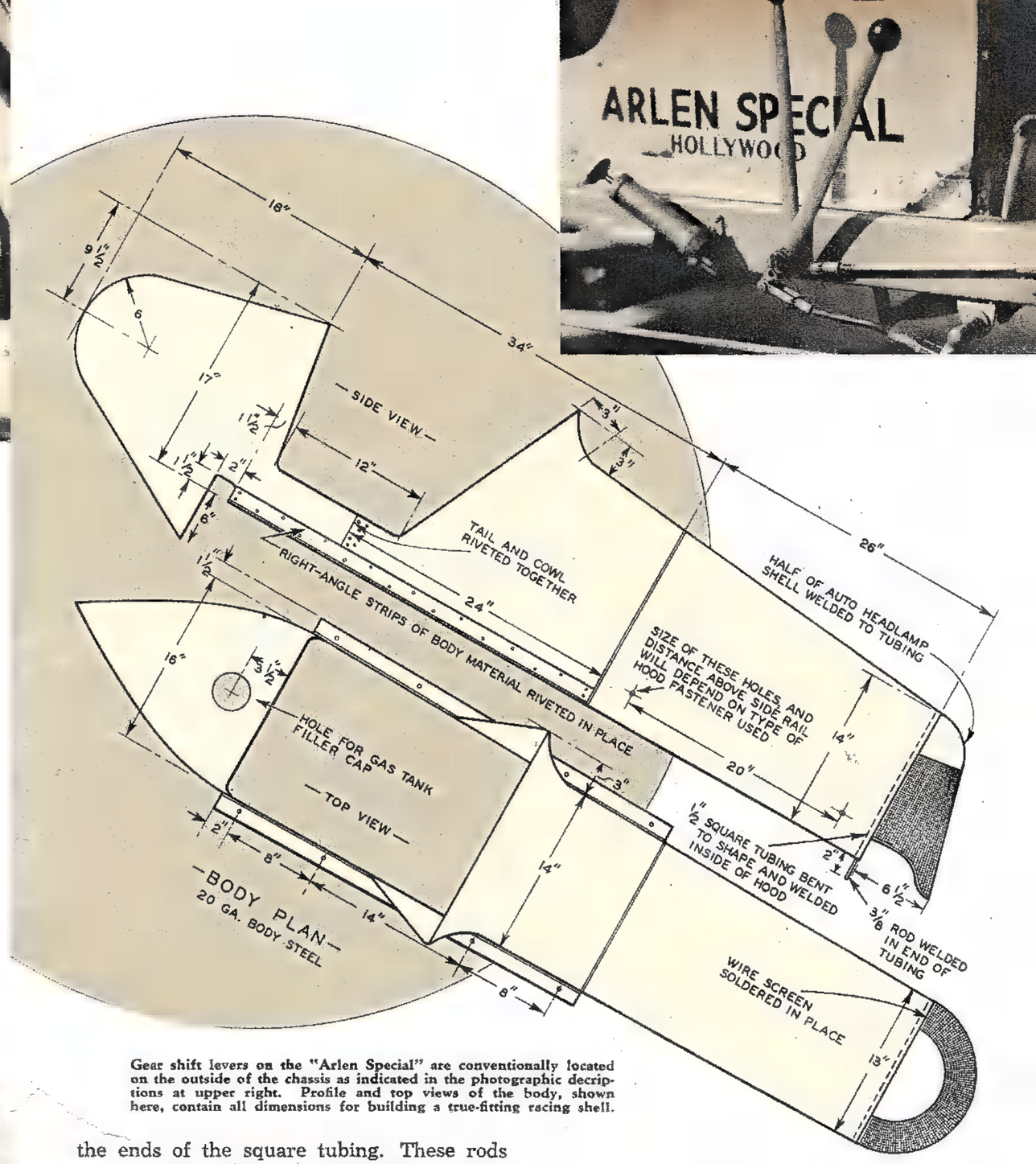
Detail of the cowl and gas tank frame construction is described in the schematic plans at left. Frames are formed from 1/2" sq., 20-gauge steel tubing and all joints securely welded. Above—Completed cowl.

The cowl, tail, and hood are made from 22-gauge body steel. You can easily make the hood and cowl—and possibly the tail. However, you can have them made at any sheet metal shop for a nominal sum.

It's much easier to build the cowl without the 3" flare, but it adds so much to the appearance of the car that it is well worth including. The tail and cowl are riveted together, then the right-angle strips, made from body material, are riveted along the bottom edge on each side. These strips will rest on the side rails where they are bolted with 1/4" bolts.

Hood and radiator shell are made in one. The pointed nose is made from half of an auto headlight shell. Bend a length of 1/2" square tubing to fit inside the front end of the hood where it is welded. Also weld the nose to the tubing. Ordinary screen wire is used to form the front end. A piece of 3/8" rod, extending down about 2", is welded into the ends of the square tubing. These rods slip into short pieces of round tubing, welded to the inside front ends of the side rails. Ordinary auto type hood fasteners hold down the hood. The rear end of the latter and the front end of the cowl rest on hood lacing, riveted to the front part of the cowl frame.

The "Arlen Special" body is formed from 22-gauge steel. The body is shown here before being installed on chassis over the cowl and tail frames.



Gear shift levers on the "Arlen Special" are conventionally located on the outside of the chassis as indicated in the photographic decriptions at upper right. Profile and top views of the body, shown here, contain all dimensions for building a true-fitting racing shell.

A snappy paint job will add greatly to the attractiveness of the car. The color scheme is, naturally, optional with the builder, but as a suggestion ■ chrome yellow body and chassis, with red wheels, trimming and lettering, is a good contrasting job.

Anyone with average driving ability can easily handle this car up to about 65 miles per hour, without any previous practice. However, beyond 65 miles per hour conditions change rapidly and it is then when you must exercise skill and caution so as to keep the car rolling on all four wheels.

Numerous tests runs have been made on the Legion-Ascot speedway near Los Angeles,

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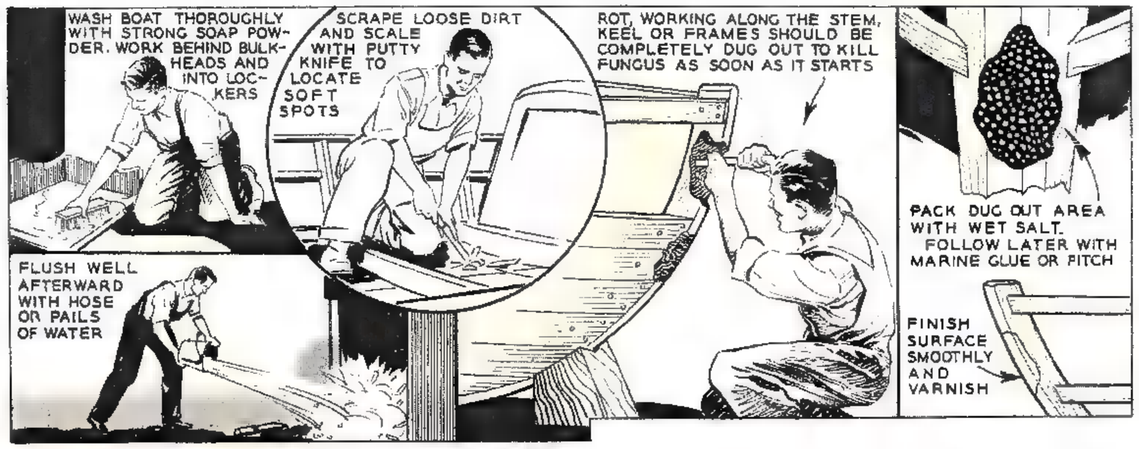
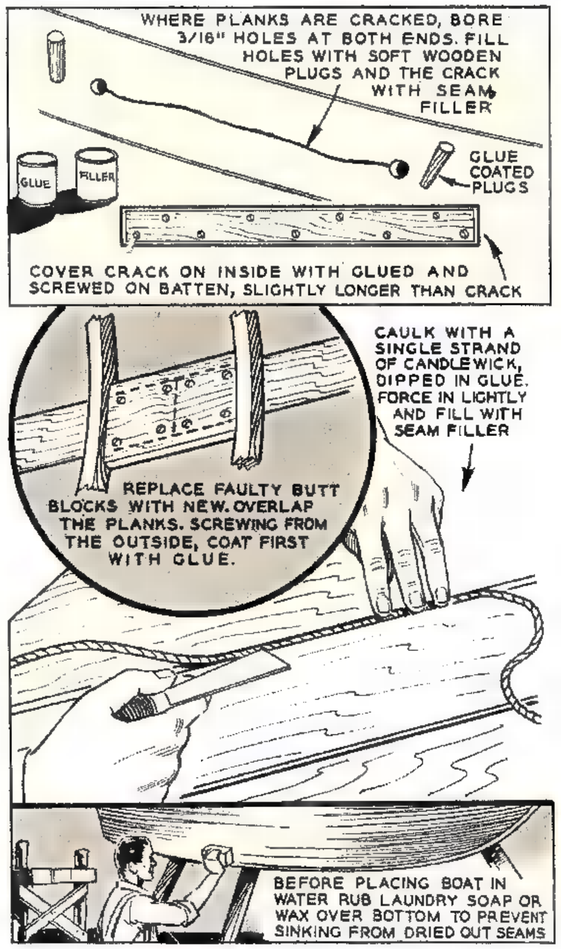
CONDITIONING YOUR BOAT FOR SUMMER SAILING



After a winter's storage, boats should be removed of their tarpaulin and allowed to dry out in the sun. The interior and exterior of the craft should then be scrubbed with soap and water. If dry rot ■ present kill by pouring salt in cavity.



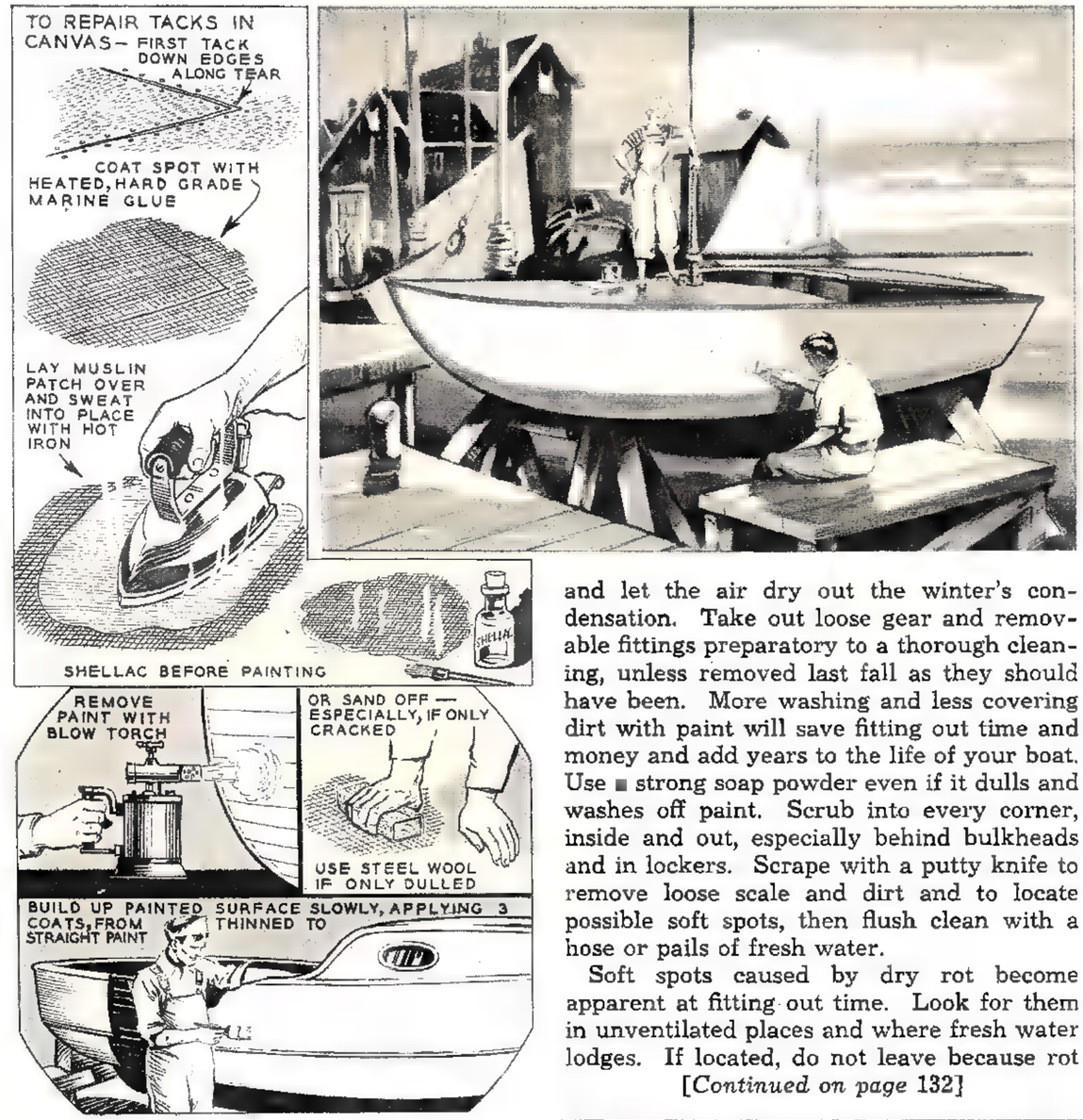
Cracks in hulls can be repaired by drilling holes at each end of crack and driving in wooden plugs, then screw on battens as shown above. Caulk open seams with single strand candlewick which has been dipped in marine glue. To prevent a craft from sinking while swelling apply soft soap to seams.

Few boats receive the attention they deserve. This article tells how many years can be added to the life of your craft by proper care of the sails, deck fittings, hull and finish.

by J. A. Emmett

EVERY hour spent overhauling and fitting out your boat, whether it be a canoe, sailboat or motorboat, the latter either inboard or outboard powered, will not only return big dividends in the way of increased pleasure secured from your outfit, but add materially to the value of your investment in hull and gear.

Thanks to American inventive genius and today's wide awake manufacturers spring fitting out work is ■ comparatively simple matter to what it was not so many years back when less fortunate owners had to either use indifferent paints or mix their own, then wait days for surfaces to harden. Standardized small boats built of late years by reputable manufacturers are constructed of the best of materials; given halfway decent care structural repairs will not be necessary for years to come. Modern marine engines, both inboard and outboards, are clean in operation and sound engineering practice insures such long life that, barring accidents, overhauls are necessary but once in five years time and even then manufacturers stand ready to give ■ thorough factory job at minimum cost. Better cleaners, abrasives, rot preventatives



Canvas deck repairs can be neatly made by applying marine glue to the torn area and allowing it to dry. A piece of new muslin or light canvas is then placed over the glued surface and secured with a hot flat iron. Old paint should be removed with a file tang and blow torch. In repainting a boat apply a thinned coating first, slightly thinned second coat and straight paint for the final. Use turpentine for thinning the paint.

and solvents enable the owner to secure a cleaner undersurface for later painting in the shortest possible time and quick drying paints developed especially for boat use shorten the finishing period, offset the unreliability of spring weather and give a surface to withstand a full summer's use.

If your boat has been covered with a tarpaulin, get the canvas off the first warm day and let the air dry out the winter's condensation. Take out loose gear and removable fittings preparatory to a thorough cleaning, unless removed last fall as they should have been. More washing and less covering dirt with paint will save fitting out time and money and add years to the life of your boat. Use ■ strong soap powder even if it dulls and washes off paint. Scrub into every corner, inside and out, especially behind bulkheads and in lockers. Scrape with a putty knife to remove loose scale and dirt and to locate possible soft spots, then flush clean with a hose or pails of fresh water.

Soft spots caused by dry rot become apparent at fitting out time. Look for them in unventilated places and where fresh water lodges. If located, do not leave because rot

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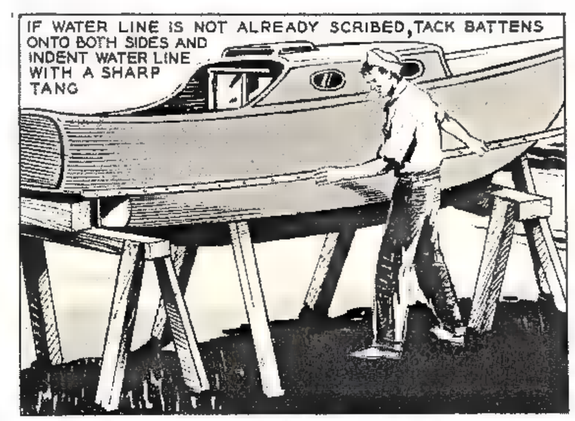

A WALNUT and COPPER ICE BUCKET

by Dale R. Van Horn

FEW home workshop projects will find greater appeal during the hot summer months than will this turned walnut ice bucket. The hostess will take considerable pride in using it when serving party guests, for its antique design will undoubtedly bring many favorable comments. By slightly altering the original dimensions, either larger or smaller, the bucket can be used also as a bottle chiller for tomato or fruit juices or as a smart container for candies and nuts. For the latter purpose, a spun copper lid provides the bucket with a distinctive closure.

Get a solid piece of wood if possible or glue up pieces to give you a square slightly less than 5 by 5 inches and about 9 inches long. This particular job was turned inside with a metal lathe because of its depth and because the sides could be made more accurately.

After the inside had been turned, the piece was transferred to a jig in the wood working lathe, snuggled to a tight fit, the tail stock brought into use and the outside turned down to the dimensions shown. Note that whereas the final outside diameter at the top is 4½ inches, it is only 4⅜ inches at the bottom. The bottom diameter can be 4 7/16 inches if you care to work with close figures. The slight taper is not noticeable to the eye, but it does permit the tapping of each hoop to a snug fit after the ends are soldered.

Cut the copper strips for the hoops ½-inch wide and of the necessary length, including a ½-inch overlap. To make a strong, yet scarcely noticeable, joint, lay ½-inch of each end of the hoop over the top of the vise and hammer flat until the copper is approximately one-half the original thickness. Turn the piece over and make the same mark on the opposite side of the other end. Heat these ends with a blow torch, one at a time, and tin them well by rubbing with solder. Make another check against diameter, clamp the joint at one edge with the pliers and again heat in the flame. When the solder is soft, quickly clamp the other side of the joint with another pair of pliers and hold until the solder has set. This makes a joint only slightly more than the original copper thickness and if you have matched the outside seam well it will be inconspicuous. The next step is to tap the hoop home on the bucket. A tri-square or any flat metal having square edges will do nicely. Turn the piece in the lathe continually as you tap it in position to prevent breaking the seam. If hook is too tight,

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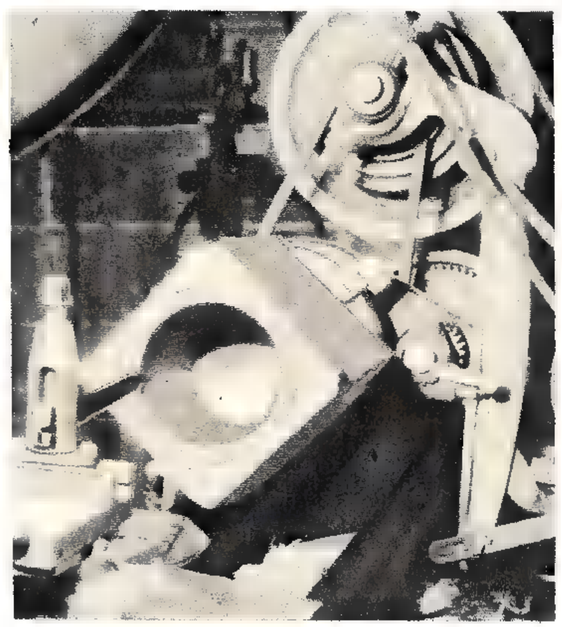
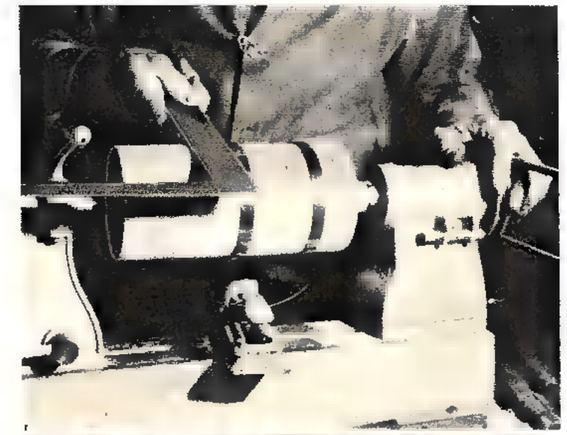
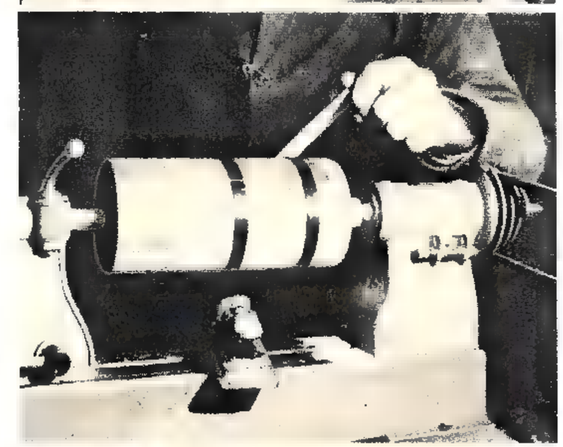
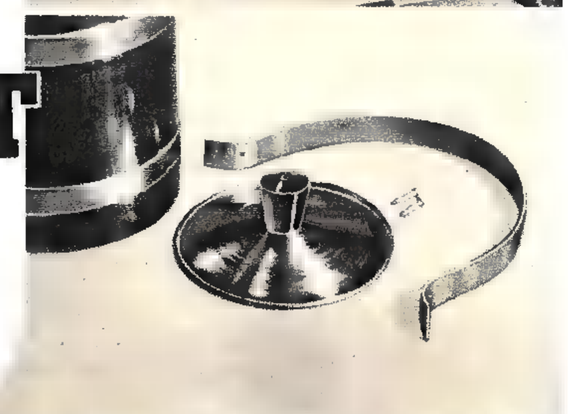
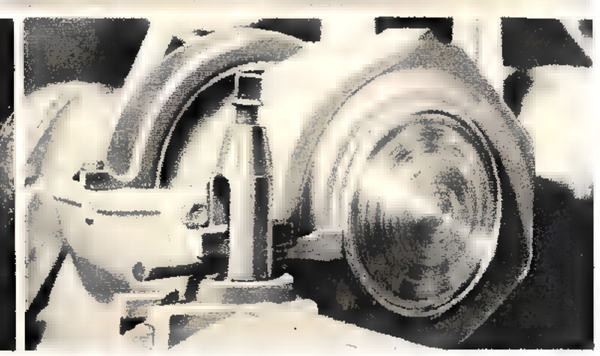


Turn the ice bucket from a solid or glued-up block of walnut measuring 5 by 5 by 9 inches. The inside of the container is best turned on a metal working lathe in manner shown above.









After completing the inside turning, remove the block from the metal lathe, turning down the outside to a diameter of 4½ inches. Copper hoops are then driven over the cylinder and trued up with a tri-square, after which they are polished with a file and steel wool as depicted in the above illustrations showing construction through the various stages. The lid jig is turned from pine and the copper closure spun over it. After spinning the copper lid, trim off the edges and remove pine jig.

"ETHER IMP"— A 3/4-Meter Transmitter

by Bill Bartlett

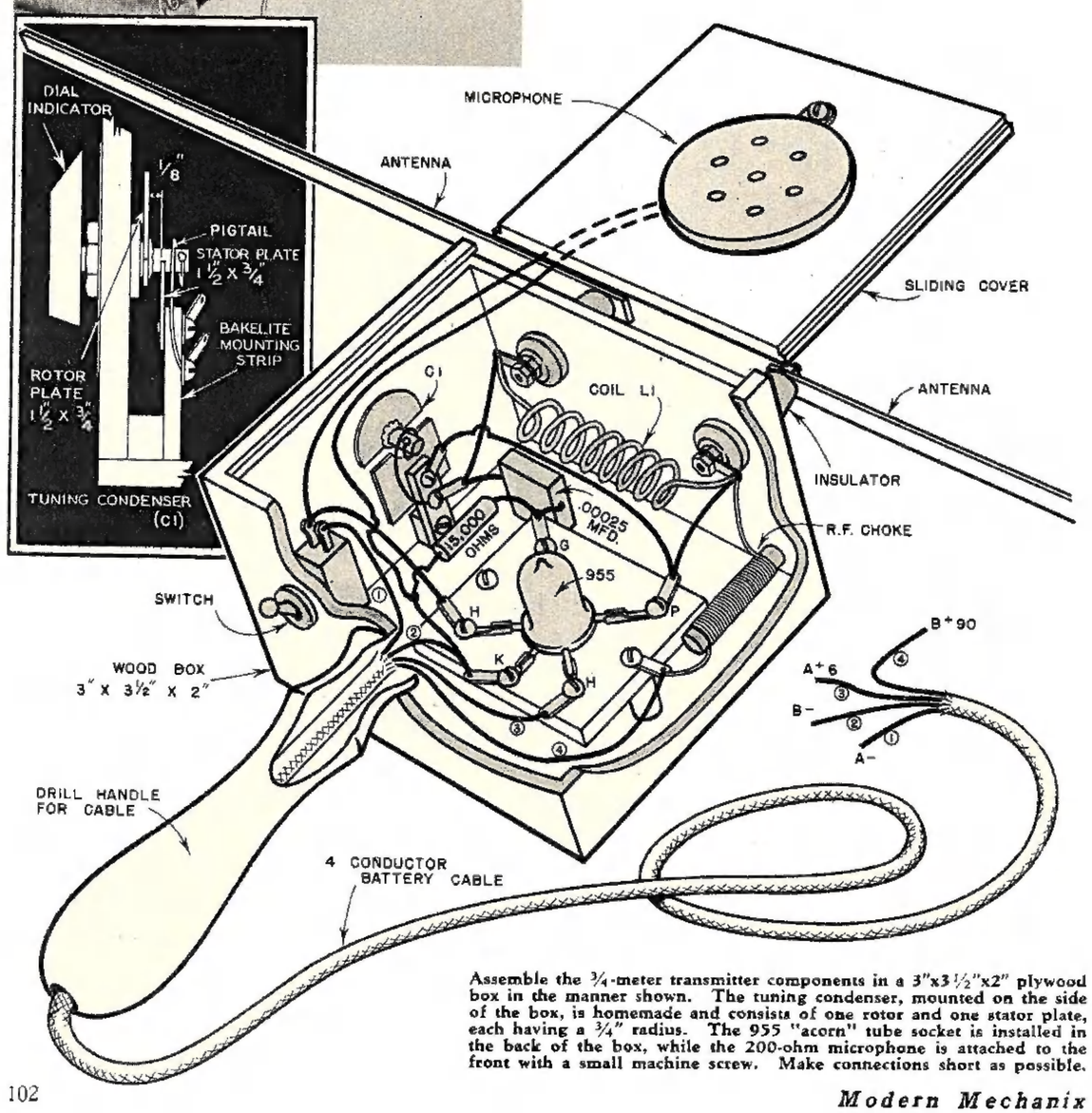
No larger than a sports announcer's hand microphone, this tiny transmitter provides a novel method for transmitting on ultra-short waves.

PRESENTING the "Ether Imp," perhaps the tiniest, and certainly one of the most fascinating radio transmitters ever designed. It is so light and compact that it may be carried about even more conveniently than the conventional sports mike used by professional radio announcers at outdoor events. The battery supply for the transmitter is small enough to slip into coat or overcoat pocket and a small flexible cord from transmitter to pocket provides battery leads.

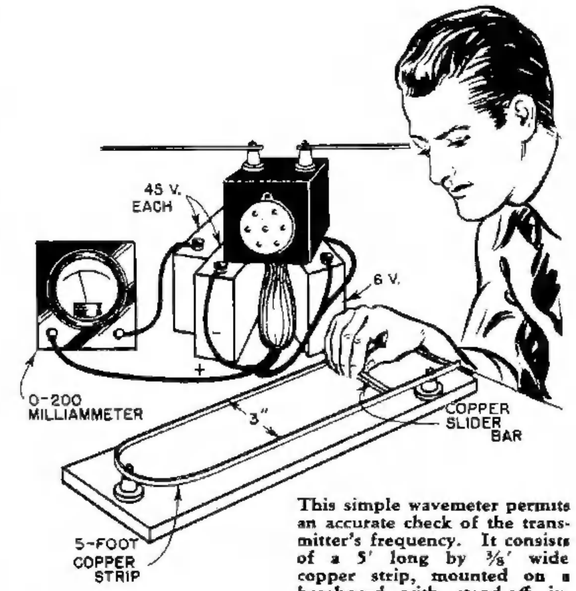
The ¾ meter band is destined to become popular with radio amateurs doing short distance work. The range of this transmitter is from one-half-mile, under poor conditions, to as much as two or three miles, or even better, under more conducive weather conditions. This is the ideal outfit for the beginner who wishes to maintain contact with a friend over a short range, or for the amateur who wishes to conduct ¾ meter field experiments during the summer.

The transmitter is simple enough for even a beginner, with absolutely no experience, to build, since the parts are few and the diagrams show clearly the situation and connection of each part. The most important point of the construction is to keep all leads as short as possible since at this high frequency long wires in the circuit result in capacities that tend to pull the set out of its proper frequency band.

The type 955 "acorn" tube accounts, in a large measure, for the set's tiny proportions. This tube, which is about the size of a person's little fingertip, has a glass envelope [*Continued on page* 130]

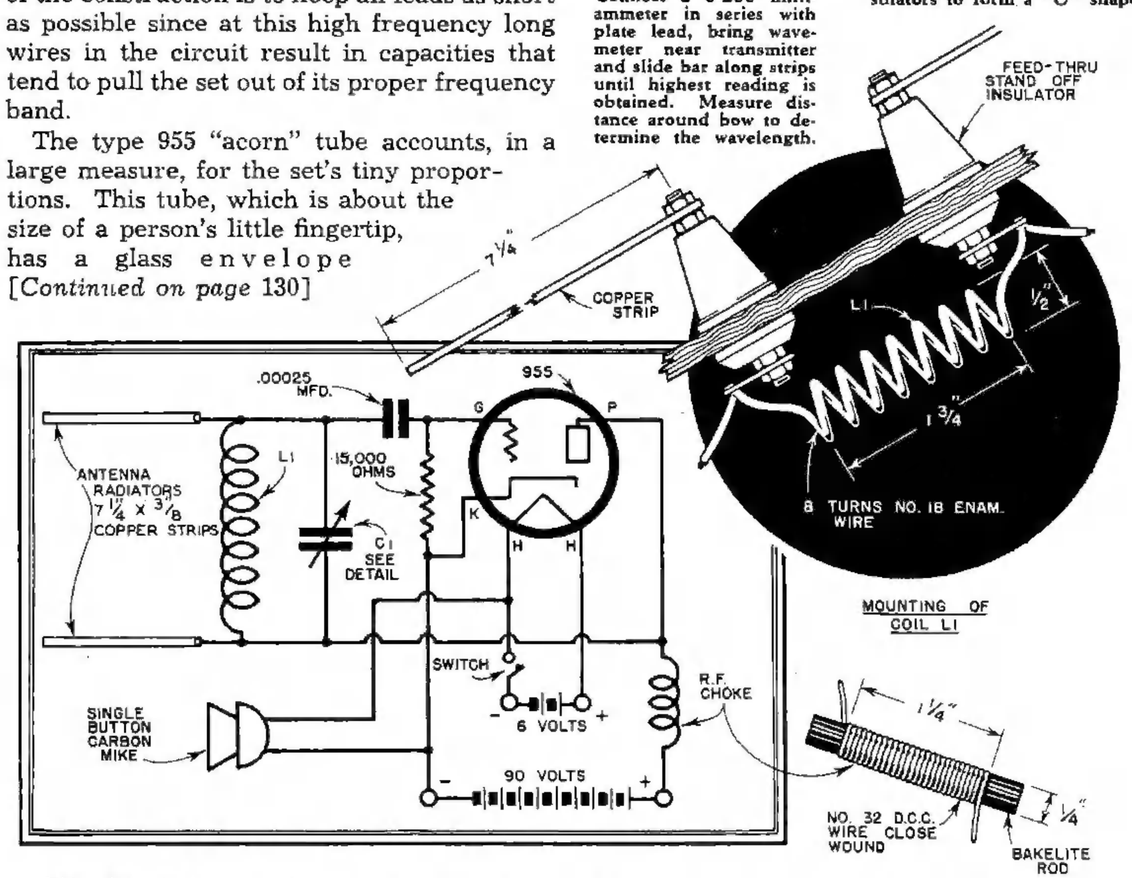


Assemble the ¾-meter transmitter components in a 3"x3½"x2" plywood box in the manner shown. The tuning condenser, mounted on the side of the box, is homemade and consists of one rotor and one stator plate, each having a ¾" radius. The 955 "acorn" tube socket is installed in the back of the box, while the 200-ohm microphone is attached to the front with a small machine screw. Make connections short as possible.



Connect a 0-200 milliammeter in series with plate lead, bring wavemeter near transmitter and slide bar along strips until highest reading is obtained. Measure distance around bow to determine the wavelength.

This simple wavemeter permits an accurate check of the transmitter's frequency. It consists of a 5' long by ⅜' wide copper strip, mounted on a baseboard with stand-off insulators to form a "U" shape.



This schematic diagram indicates the utter simplicity of the transmitter's circuit. The tuning inductance is wound with No. 18 enameled copper wire as shown in inset. The choke coil is wound with No. 32 d.c.c. wire on a ¼" Bakelite dowel. The antenna radiators, which mount to the stand-off insulators, each measure 7¼"x⅜".

HOME CAMERA STUNTS

This looks like a cozy log cabin in the mountains, with the owner's car ready outside the door to take him to town. Actually, this is a "table top" shot. The cabin is a cleverly-made model of lollypop sticks and cardboard, and the flashy roadster is a rubber toy purchased for a dime in a chain store!

This realistic lake scene will fool many people. The plane really flies, but it is only about a foot long! The placid "lake" is a mirror; the shore is beach sand; the "trees" are tiny twigs from window plants. An excellent example of ingenuity and good photography made with an ordinary hand camera.

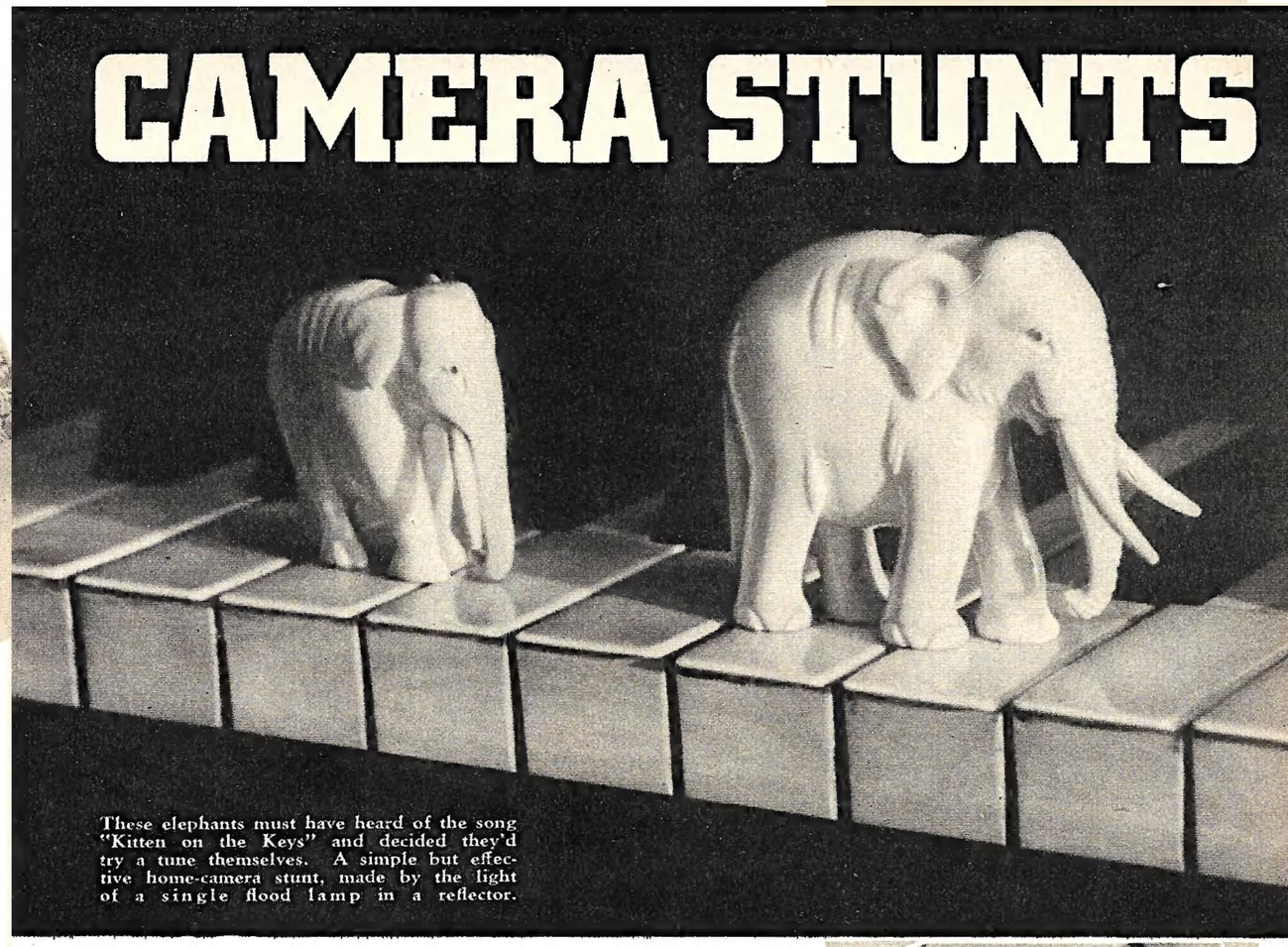
As almost every motion picture goer knows, the Hollywood studios are continually fooling us these days with scenes photographed in miniature, such as a village street, rural winter snow scene, a ship at sea, an airplane wreck and what not else. So cleverly are these miniature "sets" designed and photographed that in the picture their lack of reality defies detection, and when we are let in on the secret, we do not mind at all. Indeed, we admire the achievement.

Have you ever tried creating miniature scenes yourself and photographing them with your own camera? It's fun. Depending upon your skill, artistic ability and the materials you employ, you may construct and photograph miniature sets in your own home that will rival the semblance of reality achieved in Hollywood; or, if you prefer, you may create scenes of fantasy, comedy or burlesque to compare with a "shot" in an animated cartoon.

For a "still" camera, this is really nothing else than table-top photography, such as has long been practiced by amateurs, but which now is photographically much easier for the amateur than it used to be, because of the recent introduction for home use of more powerful artificial lighting. For table-top photography you can very cheaply, with two or three of these brighter home flood light bulbs, rival the lighting equipment of Hollywood studios, and, what is more, do good work with an inexpensive fixed-focus camera, provided you use a portrait attachment to secure the necessary close-up focus.

Constructing one of these sets requires, of course, a certain amount of time and patience, with the expense depending upon the materials you put into it. Very amusing scenes may be created, however, with-

[*Continued on page* 142]

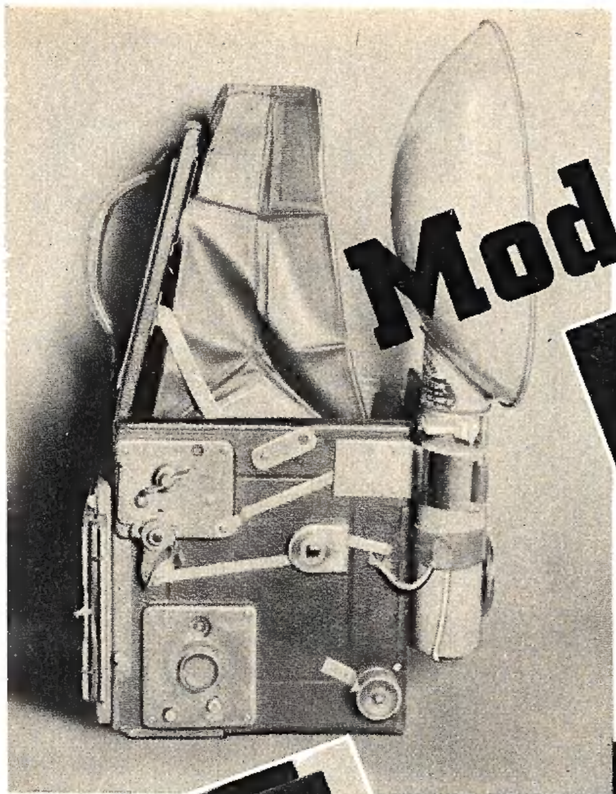


These elephants must have heard of the song "Kitten on the Keys" and decided they'd try a tune themselves. A simple but effective home-camera stunt, made by the light of a single flood lamp in a reflector.

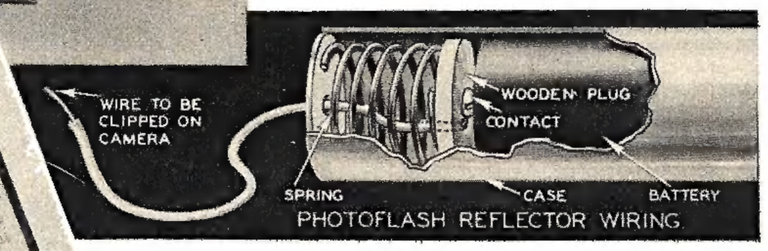
An amateur photographer-entomologist raided his specimen jars for the "props" for this weird scene, which represents a "Grasshopper Night Club." Note the "fan dancer" performing for amusement of assembled guests. Specimens are held temporarily in place by specks of rubber cement.

Modernizing Your GRAFLEX

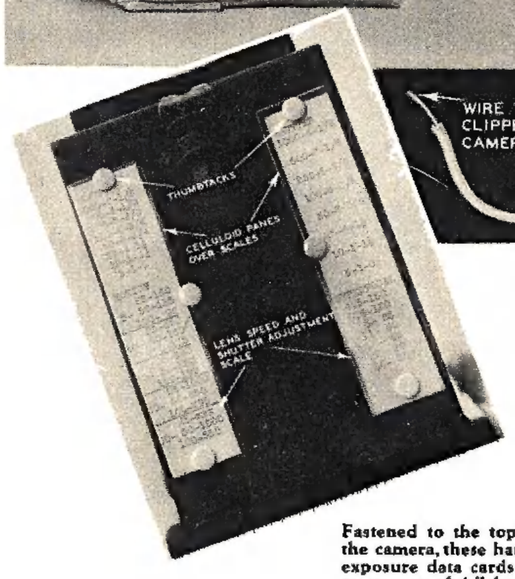
Simple gadgets that bring this efficent news camera up to date.



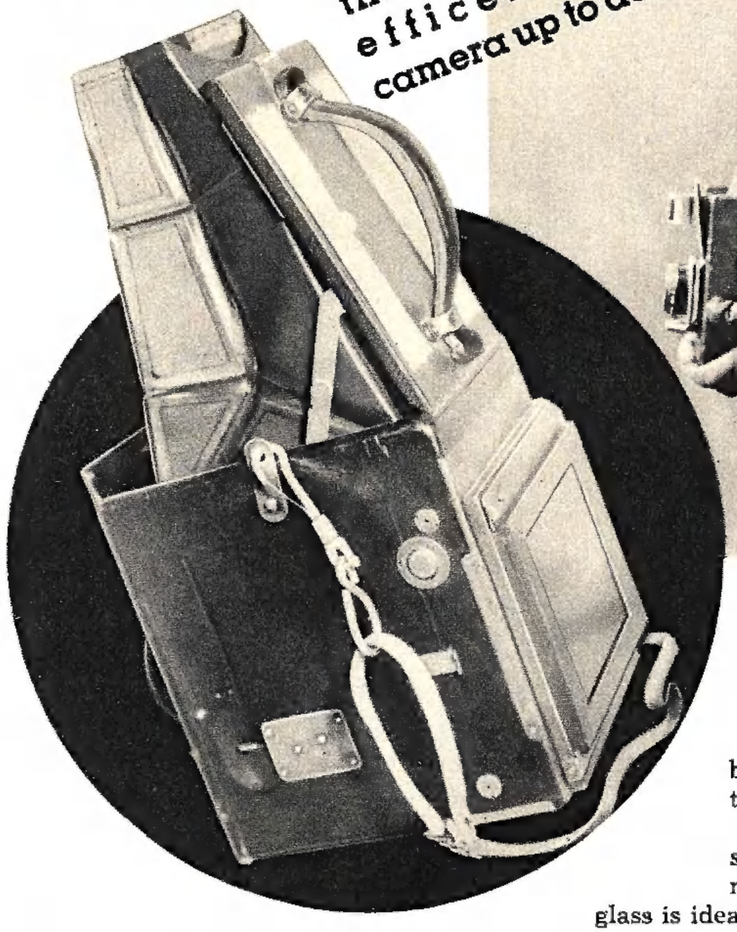
This metal indicator permits distances to be inscribed on focusing knob for instant adjustment, eliminating use of camera's focusing screen.



A small toggle switch mounted on the side of the Graflex permits right hand to trip "photoflash" and left hand to snap shutter. The "photoflash" holder is made from flashlight case as described above.



Fastened to the top of the camera, these handy exposure data cards insure successful "shots"



A neck strap, such as this one, permits more freedom of the hands when using the Graflex for news and commercial work. The strap, a 10c web type, is fitted with swivel snap hooks for fastening to camera box connectors.

by Everett Rudloff

DESPITE new and clever cameras of all shapes, sizes and prices, there are thousands of camera addicts who have used the time-tried Graflex with great success. With some frequency, however, they would like to make it still more useful. Many photographers build their camera equipment around a Graflex, adding other machines for special work from time to time, but falling back on the "old reliable" for their important shots.

It is this kind of work which has inspired some of the "Graflex gadgets" described here.

First in importance, because it may save the cost of the camera, is a neck strap. Neck straps are not new, except on a Graflex. Miniature cameras come equipped with the straps so that the camera may be carried at chest level all the time. While no one would choose to carry a heavy camera in that position constantly, there are occasions in news and commercial work when it is helpful to be able to let go of the camera and have your hands free.

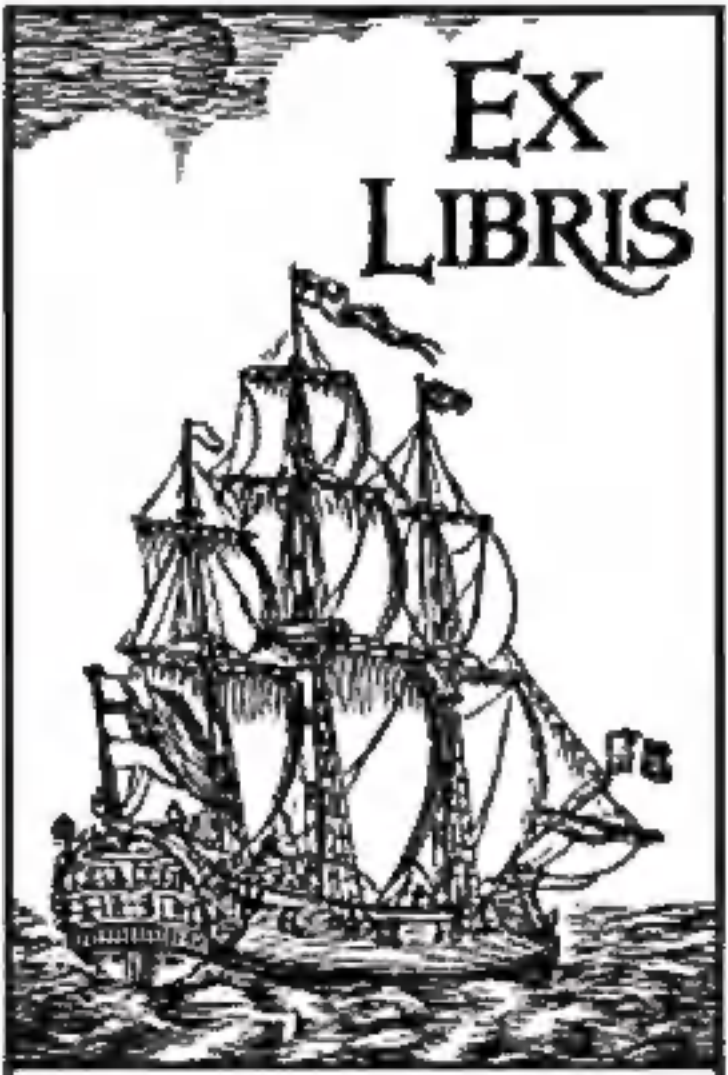
To make this strap, secure from the five and ten-cent store one web strap three feet long, two swivel snap hooks, such as are used for dog chains; two brass reinforcing strips, one inch long, and two half-inch screws. Run the plain end of the strap through the buckle and rivet it over one of the hooks. Find the mid-point of the camera case and fasten one brass strip on each side, with one screw, so that the other hole in the strip projects above the camera box, then ream the other holes to take the strap hooks.

To use the strap, open the camera to working position, snap the left hook, bring the strap around the neck and snap the right hook in position. Now, adjust the strap length with the buckle so that when using the camera in normal position the hands take the weight as usual, the neck strap being allowed just a little slack. When not in use, the strap is carried in the pocket and the two brass strips swung down along the body of the camera.

A focusing scale is a real necessity, yet few popular Graflex models have one. The ground glass is ideal for most pictures, but there are times when the light is bad, the lens is stopped way down or a night picture with photoflash is necessary and it is impossible to see the image in the hood.

An accurate focusing scale is provided by making a metal pointer for the regular focusing knob and screwing it to the camera at a 45 degree angle with the bottom and front of the box so that the pointer just clears the knob. The camera is then taken outdoors and a target set up on a support. With a lens of 6½ inches focal length the following distances were measured off: 4, 5, 6, 7, 8, 12, 15, 20, 30, 45, 60, 85 feet and infinity.

With the lens over the 4-foot mark and



Anon. Malefactor